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Burlington Northern Railroad

Paradise Tie Treating Plant

Land Treatment Unit

Permit No. MTHWP-88-03

Modification No. 1

Prepared by:
Solid and Hazardous Waste Bureau
Department of Health and Environmental Sciences
Cogswell Building
Helena, Montanta 59620
(406)444-2821

June 12, 1989

PLEASE RETURN

DEPARTMENT OF
HEALTH AND ENVIRONMENTAL SCIENCES

STAN STEPHENS, GOVERNOR

COGSWELL BUILDING

STATE OF MONTANA

FAX # (406) 444-2606

HELENA, MONTANA 59620

MONTANA HAZARDOUS WASTE PERMIT

Permit No. MTHWP-88-03
Modification No. 1

Permittee: Burlington Northern Railroad
EPA Identification Number MTD000716787

Pursuant to the Montana Hazardous Waste Act (MHWA) and regulations promulgated thereunder by the Montana Department of Health and Environmental Sciences (hereafter referred to as the Department), a modified Permit is hereby issued to BURLINGTON NORTHERN RAILROAD (hereafter referred to as the Permittee), to operate a hazardous waste land treatment unit located in Sanders County, Montana, near Paradise, at latitude 47° 24' 00" and longitude 114° 48' 30".

This modified Permit consists of the conditions contained herein (including those in any attachments) and the applicable requirements in Title 16, Chapter 44, Administrative Rules of Montana (ARM) as specified in the Permit. Applicable regulations are those which are in effect on the date of issuance of this Permit (see ARM 16.44.110). The Permittee must comply with all of the terms and conditions of this Permit.

This Permit presumes that the information submitted in the land treatment Permit application dated June 29, 1987, and as modified by subsequent amendments (hereafter referred to as the Application), is accurate and that the facility will be constructed and operated as specified in the Application, except as modified by the Permit conditions. Where portions of the Application are incorporated herein by reference, they are deemed to be part of this Permit. Any inaccuracies or misrepresentations found in the Application may be grounds for the revocation or modification of this Permit (see ARM 16.44.116 through 16.44.118). The Permittee must inform the Department of any deviation from or changes in the information in the Application or in on-site operations which would affect the Permittee's ability to comply with the applicable regulations or Permit conditions.

Based on the above considerations, this Permit becomes effective on July 12, 1989, and shall remain in effect through November 1, 1995, unless revoked and re-issued, or terminated, or unless continued by the Department.

Signature: William J. Opitz for Donald E. Pizzini, Director
Montana Department of Health
and Environmental Sciences

Date: 6/13/89

"AN EQUAL OPPORTUNITY EMPLOYER"

Abbreviations Used in Permit

AA	Atomic Absorption
API	American Petroleum Institute
ARM	Administrative Rules of Montana
BN	Burlington Northern Railroad
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CFR	Code of Federal Regulations
DAF	Dissolved Air Flotation
E	East
EP	Extraction Procedure
EPA	Environmental Protection Agency
FE	Freon Extractable Oil and Grease
HDPE	High Density Polyethylene
HF	Hydrofluoric acid
ICAP	Inductively Coupled Argon Plasma
ID	Inner Diameter
LCS	Leachate Collection System
MCA	Montana Code Annotated
MDHES	Montana Department of Health and Environmental Sciences
MHWA	Montana Hazardous Waste Act
N	North
NOD	Notice of Deficiencies
PCB	Polychlorinated Biphenyls
PHC	Principal Hazardous Constituents
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RL	Rate Limit
SW	Solid Waste
TEGD	Technical Enforcement Guidance Document
TOC	Top of Casing

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MODULE I

STANDARD CONDITIONS

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MODULE I -- STANDARD CONDITIONS

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MODULE I - STANDARD CONDITIONS

A. DEFINITIONS

Application: The information submitted by Burlington Northern Railroad Waste Pile Permit Application attached to the Permittee's letter dated November 6, 1985, and as finally amended on May 10, 1988 and by Burlington Northern Railroad Land Treatment Facility Permit Application attached to the Permittee's letter dated June 29, 1987, and as finally amended March 7, 1989.

BN: Burlington Northern Railroad

BNR: Burlington Northern Railroad

Department: The Montana Department of Health and Environmental Sciences.

Permittee: Burlington Northern Railroad

Permit: Montana Hazardous Waste Permit Number MTHWP-88-03 including modifications for the land treatment unit and all attachments and application references.

Regulated Unit: Any hazardous waste management unit identified in Permit condition II.A.

Surface Impoundment Closure Plan: The information submitted to the Department by Burlington Northern Railroad entitled: Closure Plan for Paradise Tie Treating Plant Surface Impoundment; Paradise, Montana, received April 1, 1985.

B. EFFECT OF PERMIT

The Permittee is allowed to treat, store and dispose of hazardous waste in accordance with the conditions of this permit. Any treatment of hazardous waste not authorized in this permit is prohibited. Issuance of this permit does not convey property rights of any sort or any exclusive privilege; nor does it authorize any injury to persons or property, any invasion of other private rights, or any non-compliance with state or local law or regulations. Compliance with this permit constitutes compliance, for purposes of enforcement, with the Montana Hazardous Waste Act, MHWA, provided that compliance with the terms of this permit does not constitute a defense to any order issued or any action brought under 75-10-411 or 75-10-415, MCA, Section 106(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (42 U.S.C. 9606 (a), commonly known as CERCLA), or any other law providing for protection of public health or the environment.

C. PERMIT ACTIONS

This permit may be modified, revoked and reissued, or terminated for cause as specified in ARM 16.44.116 through ARM 16.44.118. The filing of a request for a permit modification, revocation and re-issuance, or termination or the receipt of notification of planned changes or anticipated noncompliance on the part of the Permittee does not stay the applicability or enforceability of any permit condition. Review of any application for a permit modification or renewal shall consider information needs and improvements in the state of control and measurement technology as well as changes in applicable regulations.

D. DURATION OF PERMIT

This permit is effective for a period through November 1, 1995, unless modified, terminated, or revoked and re-issued. However,

Federal land disposal restrictions, which include land storage of wastes, may require Burlington Northern to cease to store wastes in the waste pile, and cease to apply wastes to the land treatment unit.

E. SEVERABILITY

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby.

F. DUTIES AND REQUIREMENTS

1. Duty to Comply

The Permittee shall comply with all conditions of this permit, except to the extent and for the duration such noncompliance is authorized by an emergency permit. Any permit noncompliance, other than noncompliance authorized by an emergency permit, constitutes a violation of MHWA and is grounds for enforcement action, permit termination, revocation and re-issuance, modification, or denial of a permit renewal application.

2. Due to Reapply

If the Permittee wishes to continue an activity allowed by this permit after the expiration date of this permit, the Permittee shall submit a complete application for a new permit at least 180 days before this permit expires. The request shall contain a detailed description of the additional information needed based on field or laboratory results already collected under this permit.

3. Permit Expiration

This permit and all conditions herein will remain in effect beyond the permit's expiration date, unless such activities have been banned by Federal regulations if the Permittee has submitted a timely, complete application in compliance with ARM 16.44.119, ARM 16.44120 and 40 CFR 270.18, as incorporated by reference in ARM 16.44.120 and through no fault of the Permittee, the Department has not issued a new permit. In the event the federal regulations prohibit the storage or land application of permitted wastes, all conditions except those allowing for the continued storage or land application will remain in effect, as described above.

4. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for the Permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

5. Duty to Mitigate

In the event of noncompliance with the permit, the permittee shall take all reasonable steps to minimize releases to the environment from both the waste pile and the land treatment unit and shall carry out such measures as are reasonable to prevent significant adverse impacts on human health or the environment.

6. Proper Operation and Maintenance

The Permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) for the waste pile and the land treatment unit which are installed or used by the Permittee to

achieve compliance with the conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facility or similar systems only when necessary to achieve compliance with the conditions of the permit.

7. Duty to Provide Information

The Permittee shall furnish to the Department, within a reasonable time, any relevant information which the Department may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The Permittee shall also furnish to the Department, upon request, copies of records required to be kept by this permit.

8. Inspection and Entry

The Permittee shall allow an authorized representative of the Department, upon the presentation of credentials, to:

a. Enter at reasonable times upon the Permittee's premises where a regulated activity is located or conducted, or where records must be kept under the conditions of this permit;

b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required and pertaining to

either the waste pile or the land treatment unit under this permit; and

d. Sample or monitor, at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by MHWA, any substances or parameters at any location involving both the waste pile and the land treatment unit.

9. Monitoring and Records

a. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity for both the waste and the land treatment unit. The method used to obtain a representative sample of the wastes to be analyzed must be the appropriate method from Appendix I of 40 CFR Part 261 as incorporated by reference in ARM 16.44.351. Laboratory methods for wastes or other treatment media must be those specified in Test Methods for Evaluating Solid Waste Physical/Chemical Methods SW-846 (Third Edition, 1986), (SW-846); Standard Methods of Wastewater Analysis (Fifteenth Edition, 1980); or an equivalent method as specified in this Permit.

b. The Permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports and records required by this permit, and records of all data used to complete the application for this permit for a period of at least 3 years from the date of the sample, measurement, report or record for the waste pile and the land treatment unit. These periods may be extended by request of the Department at any time and are automatically extended during the course of any unresolved enforcement action regarding this facility.

c. Records of monitoring information pertaining to either the waste pile or the land treatment unit shall specify:

i. The dates, exact place, and times of sampling or measurements;

ii. The individuals who performed the sampling or measurements;

iii. The dates analyses were performed;

iv. The individuals who performed the analyses;

v. The analytical techniques or methods used; and

vi. The results of such analyses.

10. Reporting Planned Changes

The Permittee shall give notice to the Department as soon as possible of any planned physical alterations or additions to the waste pile or land treatment unit. Construction of new units may not begin until permit modification has been issued.

11. Anticipated Noncompliance

The Permittee shall give advance notice to the Department of any planned changes in the waste pile or land treatment unit or activity which may result in noncompliance with permit requirements.

12. Transfer of Permits

This Permit may be transferred to a new owner or operator only if it is modified or revoked and re-issued pursuant to ARM 16.44.115 or 16.44.116.

13. Twenty-four Hour Reporting

The Permittee shall report to the Department any noncompliance with the permit which may endanger health or the environment. Any such information shall be reported orally within 24 hours from the time the Permittee shall include the following:

a. Information concerning the release of any hazardous waste which may endanger public drinking water supplies.

b. Information concerning the release or discharge of any hazardous waste, or of a fire or explosion at the facility, which could threaten the environment or human health outside the facility. The description of the occurrence and its cause shall include:

i. Name, address, and telephone number of the owner or operator;

ii. Name, address, and telephone number of the facility;

iii. Date, time, and type of incident;

iv. Treatment, storage, or disposal unit involved;

v. Name and quantity of materials involved;

vi. The extent of injuries, if any;

vii. An assessment of actual or potential hazard to the environment and human health outside the facility, where this is applicable; and

viii. Estimated quantity and disposition of recovered material that resulted from the incident.

A written submission shall also be provided within 5 days of the time the Permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the periods of noncompliance (including exact dates and times); whether the noncompliance has been corrected; and if not, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance. The Permittee need not comply with the five-day written notice requirement if the Department waives the requirement and the Permittee submits a written report within fifteen days of the time the Permittee becomes aware of the circumstances.

14. Other Noncompliance

The Permittee shall report all other instances of noncompliance not otherwise required to be reported above, at the time monitoring reports, as required by this permit, are submitted. The reports shall contain the information listed in Condition F.13. of this Module.

15. Other Information

Whenever the Permittee becomes aware that he or she failed to submit any relevant facts in the permit application, or submitted incorrect information in a permit application or in any report to the Department, the Permittee shall promptly submit such facts or information.

G. SIGNATORY REQUIREMENT

All reports or other information requested by the Department shall be signed and certified as required by ARM 16.44.108.

H. DOCUMENTS TO BE SUBMITTED PRIOR TO PERMIT ISSUANCE

The Permittee shall submit all required documents to the Department in accordance with the schedules outlined in Module VI.

I. DOCUMENTS TO BE MAINTAINED AT FACILITY SITE

The Permittee shall maintain at the facility, until closure is completed and certified by an independent registered professional engineer, the following documents and amendments, revisions and modifications to these documents for both the waste pile and land treatment unit:

1. Waste analysis plan as required by 40 CFR 264.13 [ARM 16.44.702] and this permit.

2. Personnel training documents and records as required by 40 CFR 164.16(d) [ARM 16.44.702].

3. Contingency plan as required by 40 CFR 264.53(a) [ARM 16.44.702].

4. Closure plan as required by 40 CFR 264.112(a) [ARM 16.44.702].

5. Cost estimate for facility closure 40 CFR 264.77 [ARM 16.44.702].

6. Operating record as required by 40 CFR 264.73 [ARM 16.44.702].

7. Inspection schedules as required by 40 CFR 264.15(b) [ARM 16.44.702].

MODULE II

GENERAL FACILITY CONDITIONS

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MODULE II - GENERAL FACILITY CONDITIONS

A. PERMITTED PROCESS UNITS

The Permittee is authorized to operate the following units for treatment, storage and disposal of waste subject to the limitations described below. Locations of the regulated units are shown in Attachment II.1.

1. Waste Pile located in the northwest ¼ of Section 20 Township 19 North, Range 25 West; Sanders County, Montana. All waste management activities at the Waste Pile are to be limited to those outlined in Permit Module III.

2. Surface Impoundment located in the southwest ¼ of Section 17 and the northwest ¼ of Section 20 Township 19 North, Range 25 West; sanders County, Montana. The Surface Impoundment has been closed; post-closure activities shall be in accordance with the schedule in Permit Module VI.

3. Land Treatment Unit northwest quarter of Section 20 and southwest quarter of Section 17, T.19 N., R.25W. All Waste management activities at the Land Treatment Unit are to be limited to those outlined in Permit Module III.LT.

4. Land Treatment Demonstration Plots two active plots and a control plot constructed in 1985, 12'x 48'.

B. HAZARDOUS WASTES AUTHORIZED

The Permittee is authorized to manage hazardous wastes listed in the application and described herein.

C. SPILLS

The Permittee shall decontaminate and/or remove all spills, leaks, and cleanup residue immediately after the spillage event and shall

take all steps necessary to prevent surface water or groundwater contamination as a result of any spills.

D. DESIGN AND OPERATION OF FACILITY

The Permittee shall maintain and operate the facility to minimize the possibility of a fire, explosion, or any unplanned sudden or non-sudden release of hazardous constituents to air, soil, or surface water which could threaten human health or the environment.

E. OFF-SITE WASTES

The Permittee shall receive off-site hazardous wastes only from the former BN Somers, Montana tie plant site. Wastes shall be received from Somers only in accordance with the requirements outlined in Condition III.B. and III.LT.B.

F. SAMPLING, MONITORING, AND ANALYSIS

The Permittee shall follow the sampling and analysis procedures and schedules described in Modules III, III.LT., IV, IV.LT., and V of this Permit.

G. SECURITY

The Permittee shall comply with the security provisions specified in Attachment II.2.

H. GENERAL INSPECTION REQUIREMENTS

The Permittee shall follow the inspection schedule outlined in Attachment II.3. and Permit Modules III., III.LT., IV., and IV.LT. The Permittee shall remedy any deterioration or malfunction

discovered by an inspection as required by 40 CFR 264.15(c) as incorporated by reference in ARM 16.44.702. Records if inspections shall be kept as required by 40 CFR 164.15(d) as incorporated by reference by ARM 16.44.702.

I. PERSONNEL TRAINING

The Permittee shall conduct personnel training as required by 40 CFR 264.16 as incorporated by reference in ARM 16.44.702. This training program shall follow the conditions outlined in Attachment II.4. The Permittee shall maintain training documents and records as required by 40 CFR 264.16(d) and (e) as incorporated by reference in ARM 16.44.702.

J. GENERAL REQUIREMENTS FOR IGNITABLE, REACTIVE, OR INCOMPATIBLE WASTE

The Permittee shall comply with the requirements of Permit Module III and III.LT.

K. LOCATION STANDARDS

Any hazardous waste management unit or portion of a unit located in a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout or any hazardous waste by a 100-year flood.

L. PREPAREDNESS AND PREVENTION

The Permittee shall comply with all conditions specified in Attachment II.5.

M. CONTINGENCY PLAN

1. Implementation of Plan

The Permittee shall comply immediately carry out the provisions of the contingency plan in Attachment II.6., and follow the emergency procedures described by 40 CFR 264.56 as incorporated by reference in ARM 16.44.702 whenever there is a fire, explosion, or release of hazardous waste or constituents which threaten or could threaten human health or the environment.

2. Annual Reports and Fees

The Permittee shall comply with the reporting requirements of Permit Modules III, III.LT., IV, IV.LT., and VI, and ARM 16.44.404, ARM 16.44.417 and ARM 16.44.703 and shall be subject to the fee schedules of ARM 16.44.125 and ARM 16.44.404, as applicable.

N. MANIFEST SYSTEM

The Permittee shall comply with the manifest requirements of 40 CFR 264.71, 264.72, and 264.76 as incorporated by reference in ARM 16.44.702.

O. RECORDKEEPING AND REPORTING

1. The Permittee shall maintain a written operating record at the facility in accordance with 40 CFR 264.73(a), (b)(1), (2), (3), (4), (5), (6), as incorporated by reference in ARM 16.44.702, and with this Permit.

2. The Permittee shall comply with the annual report requirements of ARM 16.44.703.

P. LIABILITY REQUIREMENTS

The Permittee shall demonstrate continuous compliance with the requirements in ARM 16.44.817 through 16.44.822 and the documentation requirements of permit Condition V.N., including the requirements to have and maintain liability coverage for sudden and accidental occurrences in the amount of at least $1 million per occurrence with an annual aggregate of at least $2 million, exclusive of the legal defense costs. Changes in the liability coverage mechanism must be approved by the Department.

Q. INCAPACITY OF PERMITTEE, GUARANTORS, OR FINANCIAL INSTITUTION

The Permittee shall comply with ARM 16.44.816.

R. CLOSURE

1. Performance Standard

The Permittee shall close each unit as required by 40 CFR 264.11 as incorporated by reference in ARM 16.44.702 and in accordance with the closure plan described in Modules III, III.LT., IV, IV.LT., and V.

2. Disposal or Decontamination of Equipment

The Permittee shall decontaminate and/or dispose of all facility equipment as required by 40 CFR 264.114 as incorporated by reference in ARM 16.44.702.

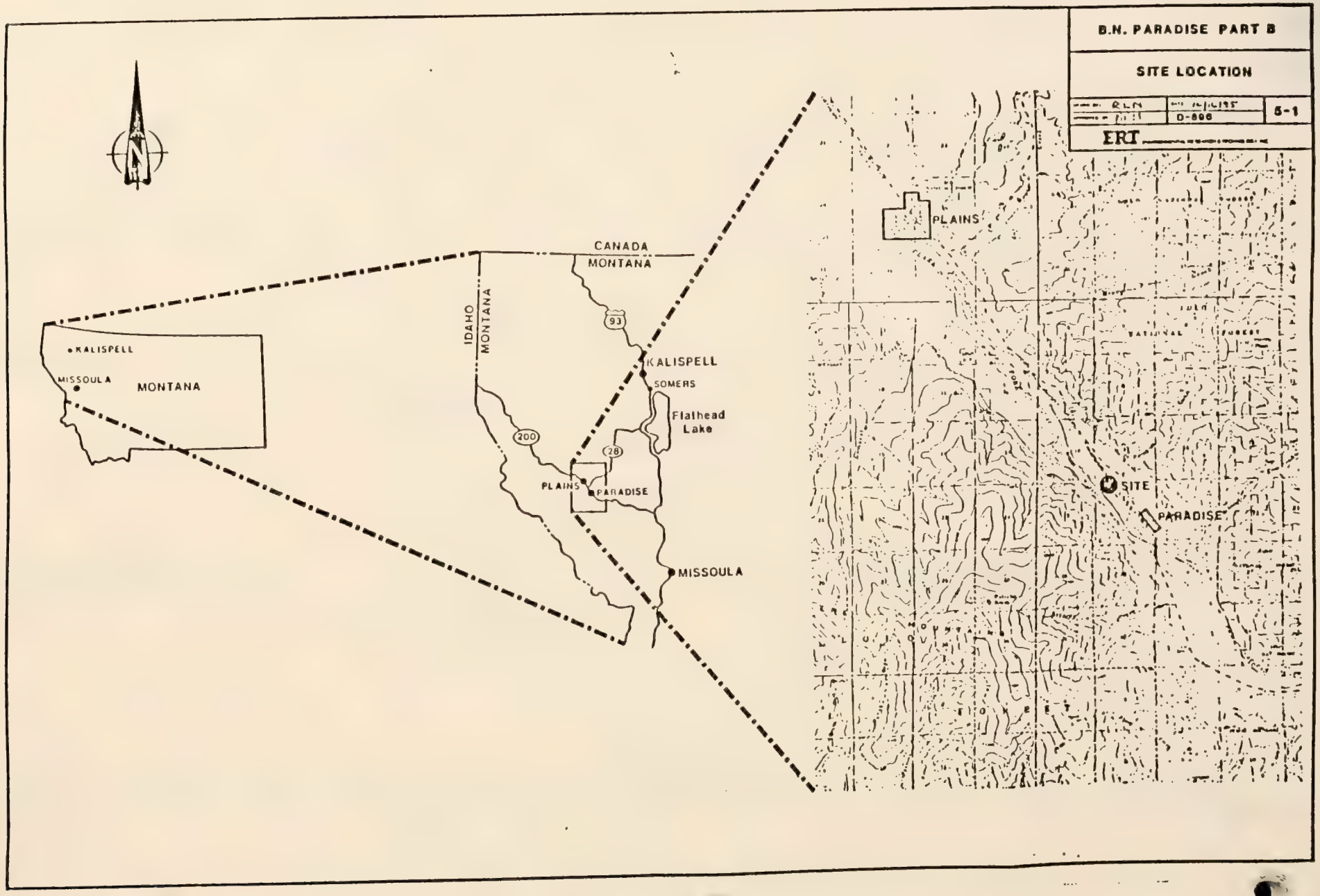
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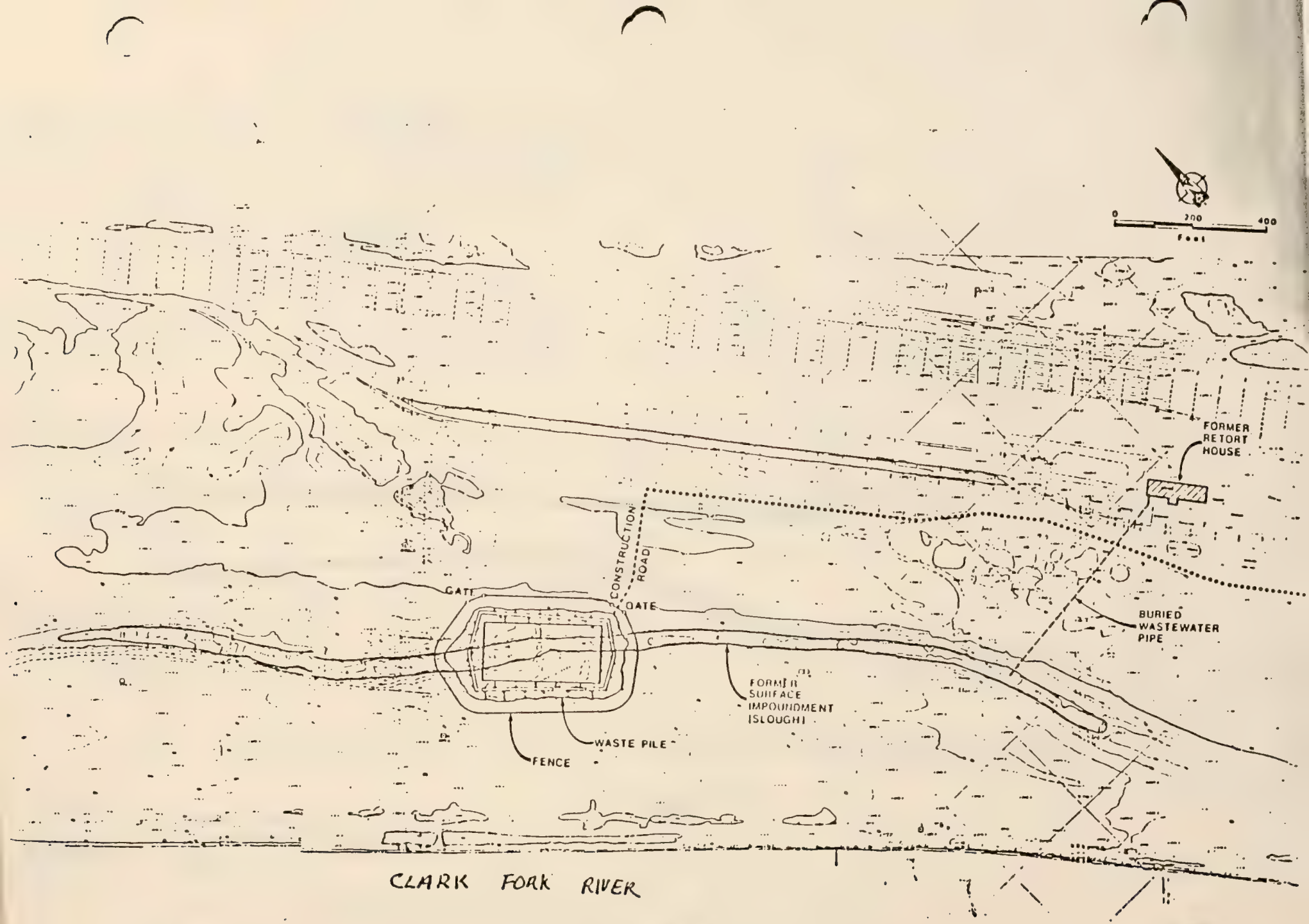
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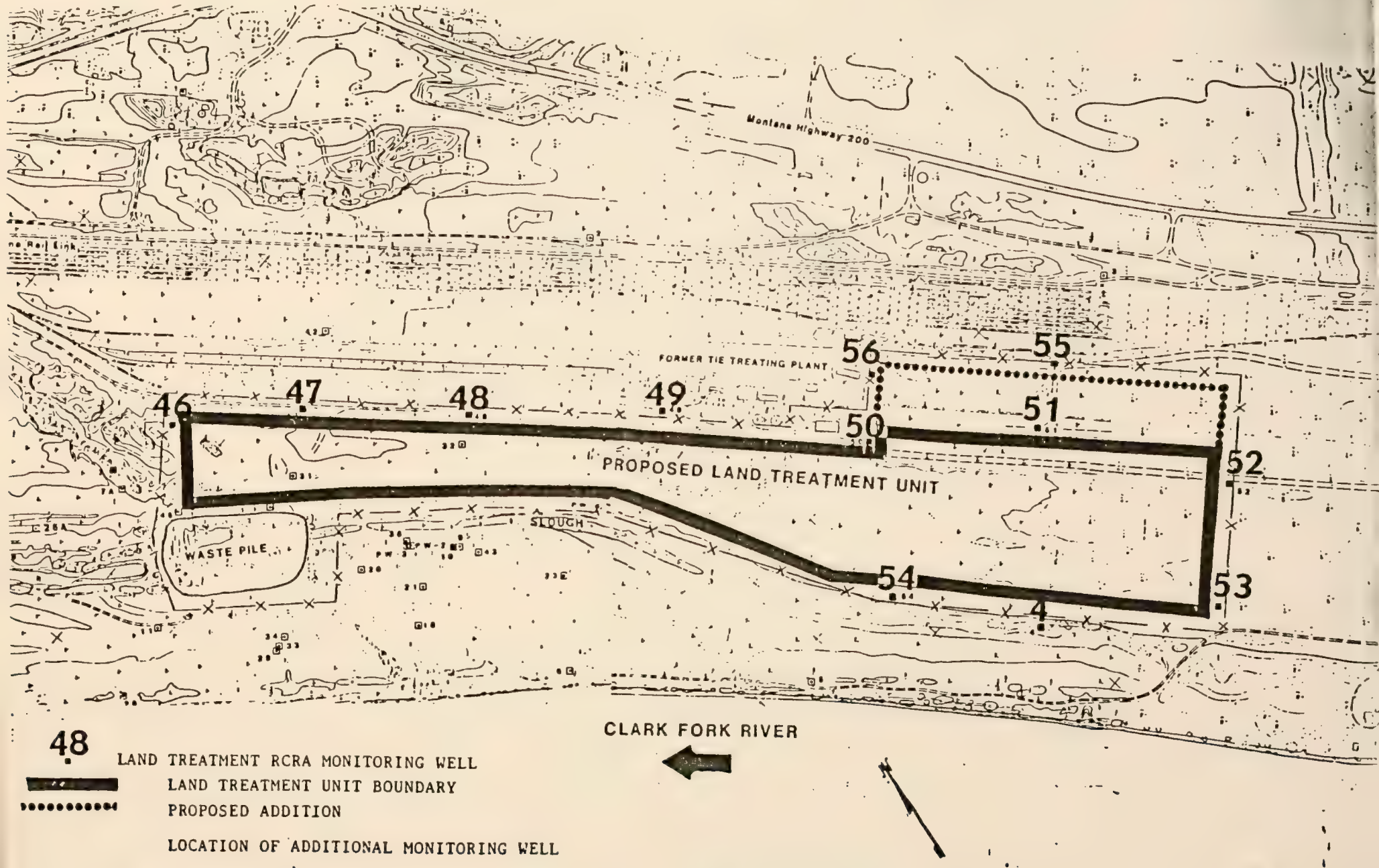
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Attachment II.4.	Personnel Training
Attachment II.5.	Preparedness and Prevention
Attachment II.6.	Contingency Plan

ATTACHMENT II.1.

MAPS SHOWING RCRA UNITS


B.N. PARADISE PART B
SITE LOCATION
5-1
ERT
CANADA
MONTANA
IDAHO
MONTANA
KALISPELL
MISSOULA
MONTANA
93
KALISPELL
SOMERS
Flathead
Lake
200
28
PLAINS
PARADISE
MISSOULA
PLAINS
SITE
PARADISE


0
200
400
Feet
FORMER RETORT HOUSE
CONSTRUCTION ROAD
GATE
GATE
BURIED WASTEWATER PIPE
FORMER SURFACE IMPOUNDMENT (SLOUGH)
WASTE PILE
FENCE
CLARK FORK RIVER


Montana Highway 200
FORMER TIE TREATING PLANT
46
47
48
49
50
51
52
53
54
55
56
PROPOSED LAND TREATMENT UNIT
SLOUGH
WASTE PILE
CLARK FORK RIVER
48
LAND TREATMENT RCRA MONITORING WELL
LAND TREATMENT UNIT BOUNDARY
PROPOSED ADDITION
LOCATION OF ADDITIONAL MONITORING WELL

ATTACHMENT II.2.

SECURITY PROVISIONS

FOR WASTE PILE AND LAND TREATMENT UNITS

8.0 SECURITY -- Waste Pile

This section of the permit application describes the security measures for the Paradise waste pile. These measures are designed to prevent unknowing entry and to minimize the possibility of unauthorized entry of persons or livestock onto the waste pile, in compliance with [40 CFR Parts 270.14(b)(4) and 264.14].

The Paradise site is located in a sparsely populated area not normally frequented by people or livestock. Therefore, a 24-hour surveillance system is not judged to be necessary [40 CFR 264.14(b)(1)]. Instead, following completion of waste pile construction and placement of waste in the pile, a fence will be constructed around the perimeter of the waste pile [40 CFR 264.14(b)(2)] to replace the existing fence around the surface impoundment.

The fence will consist of 4-ft high, double-strand barbed wire. Wood fence posts will be placed at a maximum of 10-ft intervals along the fence, and at all bends in the fence and termination points. The line posts shall be a minimum of 6-in. diameter; the terminal (corner) and gate posts shall be a minimum of 8-in. diameter.

Posts will be driven to a minimum depth of 3 ft. Terminal and gate posts will be placed in a concreted hole with a minimum depth of 3 ft and a minimum diameter of 14 in.

Two 20-ft wide, double drive gates will be constructed at the locations shown on Figure 5-2 to control access. The gates will consist of the same materials as used in the fence. The gates will remain locked at all times.

Signs will be attached to the fence clearly labeling the waste pile [40 CFR 264.14(c)]. A minimum of two signs per straight section of fence will be used. The signs will be posted at 150-ft intervals around the impoundment and at each gate. The signs will state: "Danger - Unauthorized Personnel Keep Out". The signs will be legible from a distance of at least 25 ft. They will measure 10 in. by 14 in. The lettering will be 2 in. high and in English.

8.0 SECURITY - Land Treatment Unit

This section of the permit application describes the security measures for the Paradise land treatment facility. These measures are designed to prevent unknowing entry and to minimize the possibility of unauthorized entry of persons or livestock into the land treatment area. This section is written to comply with 40 CFR 270.14(b)(4) and 264.14.

The Paradise site is located in a sparsely populated area not normally frequented by people. The site itself is on property owned by Burlington Northern, Inc. and access to people or livestock is restricted. Following installation of the land treatment facility, a fence will be constructed around the perimeter of the area. The fence will consist of four double-strand barbed wires with a maximum height of four feet. Wood fence posts will be placed at a maximum of 10 feet intervals along the fence, and at all bends in the fence and termination points. The line posts will be placed in a cemented hole with a minimum depth of three feet and a minimum diameter of 14 inches.

One 20-foot wide, double-drive gate will be constructed at the location shown on Sheet Number 3 of the Paradise Land Treatment Construction Drawings to control access. The gate will consist of the same materials as used in the fence. The gate will remain locked when not in use.

Signs will be attached to the fence clearly labeling the land treatment facility. A minimum of one sign per 200 feet of straight section of fence will be used and a sign will be posted at the gate. The signs will state: "Danger-Unauthorized Personnel Keep Out". The signs will be legible from a distance of at least 25 feet. They will measure 10 inches by 14 inches. The lettering will be two inches high and in English.

ATTACHMENT II.3.

GENERAL INSPECTION PLAN
FOR
WASTE PILE AND LAND TREATMENT UNITS

9.0 INSPECTION PLAN -- Waste Pile

9.1 General Inspection Requirements

Burlington Northern will conduct regular inspections of the surface impoundment and waste pile at the Paradise site. The purpose of these inspections is to identify structural deterioration or discharges resulting in the endangerment of public health or environment.

The Paradise Plant Supervisor will be responsible for these inspections. Mel Burda, Environmental Engineer for BN will serve as the Paradise Plant Supervisor. He will either conduct the inspections himself or delegate the responsibility to another authorized individual.

The inspection schedule and procedures for the site are specified below in conformance with the requirements of [40 CFR Parts 270.14(b)(5) and 264.14(b)] for general facility standards and [Part 264.254] for waste pile inspection requirements.

Table 9-1 presents a schedule for the inspection of specific operating and structural equipment associated with the waste pile and will be maintained by the Paradise Plant Supervisor. The following section describes the specific methods and procedures to be used in the inspections and the remedial action to be undertaken in the case of deterioration or malfunction of the structures or equipment.

Results of the inspection will be recorded on Waste Pile Inspection Log Sheets (Figure 9-1). These log sheets will be retained by the Plant Supervisor at the site office. The inspection records will be kept for a minimum of three years from the date of inspection.

9.2 Inspection Procedures

9.2.1 Construction

The synthetic liners for the waste pile will be subject to extensive quality control during construction. Material will be

TABLE 9-1

INSPECTION SCHEDULE DURING WASTE PILE OPERATION

Item	Purpose	Potential Problem	Weekly	Monthly	Quarterly	Biannually
Fencing and Gates	Maintain Limited Access	Damage			[4]	[5]
Pile Cover	Prevent Infiltration	Shifting of cover, holes, erosion			[4]	[5]
Pile Berms	Prevent Run-on	Erosion				
Drainage Swales	Divert Run-on				[4]	[5]
Leachate Collection Sump	Disposal of Pollutant	Cracks, presence of liquids or sediments	[1]	[2]	[3]	
Leak Detection Sump	Primary Liner Defect	Cracks, presence of liquids or sediments	[1]	[2]	[3]	
Monitor Wells	Water Levels	Damage, caps locked, surface seal			[4]	[5]
Wells 26A, 27, 40, 43, 44, 45, and PW-3	Water Quality Samples	Damage, caps locked, surface seal			[4]	[5]
Fire Extinguishers	Fire Control	Improper operation			✓	
Fire Hydrants	Fire Control	Improper operation			✓	

[1] Sumps checked weekly for the first three months. If no fluid is detected during this period, sumps can be checked monthly thereafter. After the first year, sumps can be checked quarterly. If fluid is detected in the leachate sump, pump into truck, transfer to onsite rail tankcar for temporary storage. Ship leachate to offsite approved treatment facility before 90 days time. Continue weekly monitoring and pumping until 3 months pass with no fluid accumulation. If fluid is detected in the leak detection sump, contact Paradise Plant Supervisor immediately.

[2] After 3 months of weekly monitoring with no fluid detection.

[3] After 1 year on weekly/monthly monitoring with no fluid detection.

[4] For the first year.

[5] After the first year.

carefully inspected upon delivery to the site and during installation. Test welds will be performed each day under prevailing site conditions and subject to mechanical test. All production welds will be visually inspected and subject to point stressing to locate areas of adhesion. In addition, vacuum testing will be performed to ensure all seams are homogeneous and water tight.

9.2.2 Operation

The leachate collection sump and leak detection sump will be monitored weekly for the presence of liquids. Liquids present in either sump will be pumped semi-monthly via a vacuum truck and stored on-site in a 20,000 gallon rail tankcar located on a rail siding near the waste pile. A second rail tankcar will be used as backup storage for the primary tankcar when this car is in transit to an offsite commercial RCRA disposal facility. Leachate will not be stored in a rail tankcar longer than 90 days onsite to comply with the RCRA generator's temporary storage requirements [40 CFR 262.34].

BN will also inspect the overall site to ensure that the various elements are in order as intended. This includes inspection of the waste pile cover, as well as identification of potential erosion or drainage problems. Should shifting of the pile cover be observed, the panels will be realigned to completely cover the waste. If holes develop, scraps left from construction will be place over the holes and held in place by sand bags.

If erosion problems are observed, two actions can be taken by the owner. Small areas without vegetation cover will be reseeded with a seed mix corresponding to the mix originally used. If erosion problems associated with the surface contours are observed, including blockage of drainage swales, BN will regrade these areas to correct the conditions.

BURLINGTON NORTHERN RAILROAD
PARADISE TIE TREATMENT PLANT
PARADISE, MONTANA

Inspector: _____ Date: _____

Fencing:

Gates Closed? _____

Broken Strands? _____

Posts In Place? _____

Pile Cover:

Holes? _____

Panel Overlaps in Place? _____

Panels Shifted? _____

Pile Berms:

Vegetation Cover? _____

Erosion Gullies? _____

Leachate Sump:

Fluid Accumulation? _____

Depth to Fluid? _____

Volume Pumped? _____

Leak Sump:

Fluid Accumulation? _____

Depth to Fluid? _____

Drainage Swales:

Swales Clear? _____

Erosion Gullies? _____

Vegetation Cover? _____

Monitor Wells:

Depth to Water Level? _____

COMMENTS: _____

_____

_____

_____

Figure 9-1. Waste Pile Inspection Log Sheet

9.1 General Inspection Requirements

Burlington Northern will conduct inspections of the land treatment area on a weekly basis and after storms. The purpose of these inspections will be to identify any discharges which may result in the endangerment of public health or the environment. The inspections will also evaluate the general housekeeping and appearance of the land treatment area and surrounding equipment.

The inspection schedule and procedures for the Paradise land treatment facility specified in this plan are in conformance with the requirements of 40 CFR 270.14(b)(5) and 264.15(b) for the general facility standards and 40 CFR 264.273(g) for the land treatment standards.

The Paradise Land Treatment Operations (Facility) Supervisor will be responsible for these inspections. He will either conduct the inspections himself or delegate the responsibility to another authorized individual.

Table 9-1 presents a schedule for the inspection of the facility and of the specific operating equipment associated with the land treatment facility. This schedule will be maintained by the Facility Supervisor. The following section describes the specific methods and procedures to be used in the inspections.

Results of the weekly inspections will be recorded on the Land Treatment Inspection Log Sheets (Figure 9-1). These log sheets will be retained by the Facility Supervisor at the Paradise Railroad Depot or a trailer on the site. The inspection records will be kept for a minimum of three years from the date of inspection.

TABLE 9-1

INSPECTION SCHEDULE FOR THE LAND TREATMENT FACILITY AND OPERATING EQUIPMENT

ITEM	PURPOSE	POTENTIAL PROBLEMS	FREQUENCY
Fencing/Gates	Limit Access	Damage	Weekly
Berms and Dikes	Run-on and Run-off Control	Erosion	Weekly
Monitor Wells	Water Levels and Water Quality Samples	Damage,caps locked, and surface seals	Quarterly
Safety Equipment	Accident Use	Availability	Weekly
Storm Water Pond	Collection of storm water	Presence of excess liquids	Weekly

FIGURE 9-1

INSPECTION LOG FOR PARADISE LAND TREATMENT FACILITY
BURLINGTON NORTHERN RAILROAD

Inspector: _____ Date: _____

Fencing/Gates:

Gates closed? _____

Broken wires? _____

Condition of posts? _____

Safety Equipment:

Available? _____

Access? _____

Condition? _____

Monitor Wells:

Damage? _____

Caps locked? _____

Surface seal condition? _____

Storm Water Pond:

Presence of water? _____

Estimated quantity of water? _____

Treatment Area:

Erosion? _____

Run-off/Run-on controls? _____

Berms:

General condition? _____

Erosion? _____

9.2 Inspection Procedures

The land treatment facility will be subjected to extensive inspection during construction and operation of the facility. Several inspection programs will be in force during operation of the land treatment facility. These programs will address site safety equipment, operating conditions, waste analysis and land treatment discharge analysis.

All on-site safety equipment will be inspected on a weekly basis for availability in case of emergency. This inspection will include equipment such as fire extinguishers, first aid kits, contained oxygen systems and other systems which could deteriorate over time. Other inspection criteria will address the access to safety equipment and the availability of off-site equipment.

ATTACHMENT II.4.

PERSONNEL TRAINING

FOR

WASTE PILE AND LAND TREATMENT UNITS

16.0 PERSONNEL TRAINING -- Waste Pile

A training program will be implemented in accordance with the requirements of [40 CFR 270.14(b)(12) and 264.16].

All employees will be trained on procedures prior to their working on the site. Training will include:

- Proper material handling
- Maintenance of safety equipment
- Requirements for the use of respirators and personal protection equipment
- Required personal hygiene practices
- Effective response to any emergency
- Responses to fires and explosions
- Responses to material release
- Emergency procedures
- Decontamination methods
- General safety precautions

16.1 Outline and Content of Training Program [40 CFR 264.16(a)(1)]

Table 16-1 is an outline of the training program to be given to personnel involved in: 1) transport and placement of waste in the waste pile at Paradise, and 2) maintenance of the waste pile.

The truck drivers responsible for the transport of the waste and placement in the waste pile will be given Parts 1, 2, and 4 of the training program. The Paradise Plant Supervisor (who will serve as the Emergency Coordinator) will be given Parts 1, 3, and 4 of the training program.

The hazardous waste training program for the Paradise waste pile consists of selected elements from this permit application. The Paradise Plant Supervisor has a copy of the program. The program is kept on file at the Paradise Railroad Depot and is available for review by regulatory officials. The formal training will be conducted whenever

TABLE 16-1

OUTLINE OF HAZARDOUS WASTE MANAGEMENT TRAINING PROGRAM

1.0 INTRODUCTION

- Overview of Hazardous Waste Regulations

2.0 WASTE TRANSPORT AND PLACEMENT

- Description of Waste to be Stored
- Description of Waste Pile
- Terms of Permit
- Travel Route and Site Plan
- Unloading Procedures
- Decontamination Procedures
- Personnel Protection
- Manifest System

3.0 WASTE PILE MAINTENANCE

- Description of Waste to be Stored
- Description of Waste Pile
- Terms of Permit
- Routine Operations and Maintenance
- Waste Analysis Program
- Recordkeeping and Reporting
- Security
- Inspections

4.0 CONTINGENCY PLAN AND EMERGENCY PROCEDURES

- Emergency Coordinator Responsibilities
- Emergency Procedures
- Emergency Response Authorities
- Location, Maintenance, and Inspection of Emergency Equipment
- Release Control
- Fire and Explosion Response

a new Plant Supervisor is hired for the Paradise plant using the training program as a basis. The training program is presented by the Burlington Northern Environmental Engineer responsible for coordinating compliance with hazardous waste regulations.

A brief description of each section of the training program follows:

- Section 1 - Introduction. This section of the program introduces the Resource Conservation and Recovery Act (RCRA). The regulatory framework for classifying hazardous wastes, setting operational standards, the permitting procedures and achieving compliance is reviewed. The RCRA permit for the Paradise Tie Treating Plant will also be reviewed to be sure that each employee is familiar with its terms.

- Sections 2 and 3 - Waste Transport and Placement; Maintenance. These sections describe the types of hazardous wastes that are generated, handled, and stored, normal/routine operations, and procedures for maintaining compliance with the RCRA permit (e.g., waste analysis, recordkeeping, inspections, and security). Site diagrams showing the dimensions, capacity, and location of the waste pile facilities are included.

  Training for normal or routine operating conditions includes the following topics:

  - Proper maintenance of the waste pile
  - Scheduled inspections
  - Purpose and use of security and communications systems
  - Requirements for tracking and recording the operation of the facilities
  - Recordkeeping requirements and procedures

- Section 4 - Contingency Plan and Emergency Procedures. This section of the training program provides detailed instruction on steps to be taken in the event of an emergency. The Emergency Coordinators are identified, as are emergency phone numbers and directions for locating and using on-site emergency equipment, alarms, and communications. Contingency plans are also described.

16.2 Training Director [40 CFR 264.16(a)(2)]

The personnel training program is directed by Mr. Mel Burda, an environmental engineer with Burlington Northern Railroad.

16.3 Training for Emergency Response [40 CFR 264.16(a)(3)]

This training program is designed to ensure that personnel not only handle hazardous wastes in a safe manner but also properly respond to emergency situations. The program trains hazardous waste handling/management personnel to maintain compliance under both normal operating conditions and emergency conditions.

Training elements addressing non-routine and emergency situations include:

- Procedures for locating, using, inspecting, repairing, and replacing facility emergency equipment
- Emergency communication procedures
- Response to fires or explosions
- Response to controlling waste releases
- Procedures for evacuation of nearby areas

16.4 Implementation of Training Program [40 CFR 264.16(b) and (c)]

In the future, all new personnel will complete the training program within six months after the date of their employment or assignment to the Paradise plant. No employee hired to work at the facility will work unsupervised prior to the completion of training.

The Paradise Plant Supervisor will meet with Burlington Northern supervisory personnel for an annual review and update of the initial training program and to discuss and study the following subjects.

1. The requirements contained in the RCRA permit, noting any changes that have occurred during the past year. Areas where maintenance or compliance is a problem are identified and discussed, and effective solutions are sought.

2. The status of operating conditions and procedures, noting any areas where there are problems or potential for problems.

3. Incidents that have occurred in the past year that warranted use of contingency plans and/or emergency action. This review focuses on the cause of the incident and identification of steps to be taken to prevent or to ensure better handling of such events in the future.

This section of the permit application details the training given to facility personnel whose jobs require them to be involved with the management of hazardous waste at Burlington Northern's Paradise land treatment site. The goal of this training plan is to reduce the potential for mistakes that could potentially threaten human health or the environment by insuring that these persons are familiar with their duties and responsibilities in the area of hazardous waste management. These procedures comply with Federal Regulations 40 CFR 270.14(b)(12) and 264.16.

The facility personnel covered by this plan are:

1) Land Treatment Operations Supervisor
2) Land Treatment Operations Personnel
3) Waste Transporters

All of the employees listed in the preceding job classifications will be trained in the proper procedures associated with hazardous waste activities prior to their working on the site.

16.1 Content of Training Program (40 CFR 264.16(a)(1)

Table 16-1 presents the outline of the training program to be given to the facility personnel involved with hazardous waste management. All of the personnel involved in the operation of the land treatment facility, including the heavy equipment operators who are responsible for the transport of the waste from the waste pile to the land treatment facility, will be given the training program.

The hazardous waste training program for the Paradise land treatment facility consists of selected chapters from this permit application. The Paradise Land Treatment Operations Supervisor will have a copy of the program. The program is kept on file at

TABLE 16-1

HAZARDOUS WASTE MANAGEMENT TRAINING OUTLINE

1.0 INTRODUCTION

Overview of Hazardous Waste Regulations

2.0 WASTE CHARACTERISTICS

Description of Waste to be Land Treated
Terms of Permit
Decontamination Procedures
Personnel Protection

3.0 GENERAL OPERATION

Description of the Land Treatment Facility
Routine Operations
Security
Inspections
Recordkeeping and Reporting

4.0 EMERGENCY AND CONTINGENCY PROCEDURES

Emergency Notification
Emergency Coordinator and Organization
Emergency Procedures
Emergency Equipment
Fire and Explosion Response

the Paradise Railroad Depot or a trailer on site and will be available for review by regulatory officials. The formal training will be conducted whenever any new personnel are hired for the Paradise land treatment facility. However, the land treatment of the waste is only expected to take approximately four years, so the need to train new personnel is expected to be minimal. The training program will be conducted by the Burlington Northern Environmental Engineer responsible for coordinating compliance with hazardous waste regulations.

A brief description of each section of the training program follows:

Introduction. This section of the program introduces the Resource Conservation and Recovery Act (RCRA). The regulatory framework for classifying hazardous wastes, setting operational standards, the permitting procedures and achieving compliance is reviewed. The RCRA permit for the Paradise Land Treatment Facility will also be reviewed to be sure that each employee is familiar with its terms.

Waste Characteristics and General Operations. These two sections describe the type of hazardous waste at the site and the land treatment operations. Site diagrams showing the location and dimensions of both the waste pile and land treatment facility are included, as well as the waste loading and unloading procedures, personnel protection, decontamination, and the procedures for maintaining compliance with the RCRA permit. Training for routine operating conditions includes scheduled inspections, purpose and use of the security and communications systems, and recordkeeping requirements and procedures.

Emergency and Contingency Procedures. This section of the training program provides detailed instruction on steps to be taken in the event of an emergency. The Emergency Coordinators are identified, as are emergency phone numbers and directions for

locating and using on-site emergency equipment and communications. Contingency plans are also described.

16.2 Training Director

The personnel training program will be directed by Mr. Bruce Sheppard. He has a Bachelor of Science degree in chemistry and is an environmental engineer for Burlington Northern in the Seattle Region. He has previously conducted hazardous waste training at Burlington Northern's diesel shop in Livingston, Montana. Mr. Sheppard has been with Burlington Northern since 1977. He is responsible for coordinating compliance with hazardous waste regulations and has been trained in all aspects of hazardous waste management.

16.3 Training for Emergency Response

This training program is designed to ensure that personnel not only handle hazardous wastes in a safe manner but also properly respond to emergency situations. The program trains hazardous waste handling/management personnel to maintain compliance under both normal operating conditions and emergency conditions.

Training elements addressing non-routine and emergency situations include:

- Procedures for locating, using, inspecting, repairing, and replacing facility emergency equipment;
- Emergency communication procedures;
- Response to fires or explosions;
- Response to controlling waste releases; and
- Procedures for evacuation of nearby areas.

16.4 Training Schedule

The facility personnel will successfully complete the training program within six months of their assignment to one of the above named positions and will not work without supervision until they have done so. In addition, these facility personnel will be required to attend an annual training review and update of the initial training procedures. An annual training review will be conducted and it will include:

- The requirements contained in the RCRA permit, noting any changes that have occurred during the past year. Areas where maintenance or compliance is a problem are identified and discussed, and effective solutions are sought.
- The status of operating conditions and procedures, noting any areas where there are problems or potential for problems.
- Incidents that have occurred in the past year that warranted use of contingency plans and/or emergency action. This review focuses on the cause of the incident and identification of steps to be taken to prevent or to ensure better handling of such events in the future.

16.5 Recordkeeping

Records will be made of the training completed by each employee and will be kept at the Paradise Railroad Depot or a trailer on site during the operating life of the land treatment facility and at least three years from the date the individual left the facility. When the land treatment facility is closed, all records will be transferred to Burlington Northern Railroad's Seattle Regional Office where they will be retained for at least three years after closure.

ATTACHMENT II.5.

PREPAREDNESS AND PREVENTION

FOR THE

WASTE PILE AND LAND TREATMENT UNITS

This section describes the efforts undertaken at the Paradise plant to prevent and be prepared for response to an emergency situation. This information is provided in accordance with [40 CFR Part 270.14(b)(6)] and [40 CFR Parts 264.30 through 264.37]. A more detailed description of emergency procedures is addressed in the Contingency Plan, Section 11.0 of this permit application.

10.1 Facility Design and Operation [40 CFR 264.31]

Details of the design and operation of the waste pile are provided in Part III, Section 23.0 (Detailed Plans and Engineering Report) of this permit application. It is important to note that the probability of a fire, explosion, or release of hazardous waste resulting in a potential threat to human health or the environment is remote because:

1. The waste to be stored at Paradise will be deposited on the waste pile immediately following construction

2. The waste is non-combustible and non-reactive.

Nevertheless, Burlington Northern has implemented procedures to ensure the health and safety of personnel on the plant site during construction and operation of the waste pile. These procedures are specified in the Contingency Plan.

10.2 Equipment

10.2.1 Internal and External Communication Systems [40 CFR 264.32(a)(b)]

The Paradise Plant Supervisor or his delegate will be the only individual on the site. The Plant Supervisor will visit the site and inspect the waste pile according to the schedule in Table 9-1 for leaks resulting from deterioration in the structure. Should a leak be detected, the discharge of the contaminant would not result in an immediate emergency to human health or the environment. Therefore, an internal alarm system in the plant site is not necessary.

The Paradise Plant Supervisor will have a two-way radio in his vehicle during inspections of the Paradise site. This will enable summoning of assistance from local emergency response organizations.

10.2.2 Emergency Equipment [40 CFR 264.32(c)]

Portable fire extinguishers, a first-aid kit, and other emergency equipment are maintained at the Paradise Railroad Depot for emergencies. Details on the specification, location, and operation of the emergency equipment are provided in Table 11-3 in the Contingency Plan.

10.2.3 Water Supply [40 CFR 264.32(d)]

Burlington Northern has an immediate on-site fire water capacity of 100,000 gallons. The system has two pumps with delivery capacities of 350 and 200 gallons per minute to be used individually; the system pressure is 28 psig. The fire hydrants are located southeast of the retort house along the access road, approximately 400 feet apart.

10.3 Equipment Testing and Maintenance [40 CFR 264.33]

A list of emergency equipment at the Paradise plant is provided in Table 11-3 in the Contingency Plan. The inspection schedule is contained in Section 9.0, Inspection Plan.

10.4 Access to Communications and Emergency Services [40 CFR 264.34]

Hazardous waste will not be handled on site following completion of waste pile construction and placement. Therefore, an internal alarm or emergency communication system is not required.

Personnel on-site during inspections will have access to a two-way radio in their vehicle in order to summon external emergency assistance. A telephone is available at the Paradise Railroad Depot.

10.5 Required Aisle Space [40 CFR 264.35]

Sufficient space will remain clear around the waste pile to enable the unobstructed movement of emergency equipment, e.g., fire-fighting vehicles. There will be a space of at least 30 ft between the perimeter of the waste pile and the fence (see Figure 5-2). The aisles will be kept clear of obstructions at all times.

10.6 Arrangements with Local Authorities [40 CFR 264.37]

Burlington Northern has established coordination arrangements with local authorities and emergency services. A description of the organizations and their responsibilities is included in Section 11.2 of the Contingency Plan. The Paradise Volunteer Fire Department has been designated the primary emergency authority for the Paradise Tie Treating Plant.

Burlington Northern has notified local authorities of the operation of the Paradise waste pile and has solicited their assistance in responding to emergencies at the plant. Copies of the letters to local authorities are included at the end of this section of the permit application. Each of the applicable organizations have been provided a copy of the Contingency Plan.

BURLINGTON NORTHERN RAILROAD

ENGINEERING DEPARTMENT

2718 Montana Avenue
Billings, Montana 59101
Telephone (406) 256-4313

Paradise Volunteer Fire Department
P. O. Box 172
Paradise, MT 59856

November 6, 1985

Gentlemen:

Burlington Northern Railroad is storing waste materials in a waste pile at the Paradise Tie Treating Plant. Some of the material stored is considered a hazardous waste due to its nature and/or constituents. As you are probably aware, the handling of hazardous wastes is governed by regulations developed by the U.S. Environmental Protection Agency for the enforcement of the Resource Conservation and Recovery Act. As required by these regulations, specifically 40 CFR 264.37, Burlington Northern Railroad is submitting a copy of its contingency plan for emergencies at its Paradise Tie Treating Plant site. The purpose of this submission is to familiarize you with the plant layout, properties of the wastes stored at the plant, the location of specific hazards, fire access roads and routes, and mutual aid agreements, all of which are discussed in the contingency plan. Please note, the plan summarizes the hazardous wastes handled at the refinery, their hazardous characteristics, potential reactions, preventative measures to be taken against the hazards, and corrective measures to be taken should a problem occur.

Should you have any questions or desire further information, please contact Dave Thomas at 857-3303, in Somers, Montana. For your information, copies of this plan have been submitted to the following emergency departments and hospitals.

1) Plains Volunteer Fire Department
2) Sanders County Sheriff's Department
3) Clark Fork Valley Hospital

Sincerely,

J. E. Daume
Chief Engineer - Region

MLB:bke

WORK:58

BURLINGTON NORTHERN RAILROAD

ENGINEERING DEPARTMENT

2718 Montana Avenue
Billings, Montana 59101
Telephone (406) 256-4313

Plains Volunteer Fire Department
Plains, MT 59859

November 6, 1985

Gentlemen:

Burlington Northern Railroad is storing waste materials in a waste pile at the Paradise Tie Treating Plant. Some of the material stored is considered a hazardous waste due to its nature and/or constituents. As you are probably aware, the handling of hazardous wastes is governed by regulations developed by the U.S. Environmental Protection Agency for the enforcement of the Resource Conservation and Recovery Act. As required by these regulations, specifically 40 CFR 264.37, Burlington Northern Railroad is submitting a copy of its contingency plan for emergencies at its Paradise Tie Treating Plant site. The purpose of this submission is to familiarize you with the plant layout, properties of the wastes stored at the plant, the location of specific hazards, fire access roads and routes, and mutual aid agreements, all of which are discussed in the contingency plan. Please note, the plan summarizes the hazardous wastes handled at the refinery, their hazardous characteristics, potential reactions, preventative measures to be taken against the hazards, and corrective measures to be taken should a problem occur.

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3) Clark Fork Valley Hospital

Sincerely,

J. E. Daume
Chief Engineer - Region

MLB:bke

WORK:58

BURLINGTON NORTHERN RAILROAD

ENGINEERING DEPARTMENT

2718 Montana Avenue
Billings, Montana 59101
Telephone (406) 256-4313

Sanders County Sheriff's Department
Court House
Thompson Falls, MT 59873

November 6, 1985

Gentlemen:

Burlington Northern Railroad is storing waste materials in a waste pile at the Paradise Tie Treating Plant. Some of the material stored is considered a hazardous waste due to its nature and/or constituents. As you are probably aware, the handling of hazardous wastes is governed by regulations developed by the U.S. Environmental Protection Agency for the enforcement of the Resource Conservation and Recovery Act. As required by these regulations, specifically 40 CFR 264.37, Burlington Northern Railroad is submitting a copy of its contingency plan for emergencies at its Paradise Tie Treating Plant site. The purpose of this submission is to familiarize you with the plant layout, properties of the wastes stored at the plant, the location of specific hazards, fire access roads and routes, and mutual aid agreements, all of which are discussed in the contingency plan. Please note, the plan summarizes the hazardous wastes handled at the refinery, their hazardous characteristics, potential reactions, preventative measures to be taken against the hazards, and corrective measures to be taken should a problem occur.

Should you have any questions or desire further information, please contact Dave Thomas at 857-3303, in Somers, Montana. For your information, copies of this plan have been submitted to the following emergency departments and hospitals.

1) Plains Volunteer Fire Department
2) Paradise Volunteer Fire Department
3) Clark Fork Valley Hospital

Sincerely,

M. L. Gurda
for

J. E. Daume
Chief Engineer - Region

MLB:bke

WORK:58

BURLINGTON NORTHERN RAILROAD

ENGINEERING DEPARTMENT

2718 Montana Avenue
Billings, Montana 59101
Telephone (406) 256-4313

Clark Fork Valley Hospital
Plains, MT 59859

November 6, 1985

Gentlemen:

Burlington Northern Railroad is storing waste materials in a waste pile at the Paradise Tie Treating Plant. Some of the material stored is considered a hazardous waste due to its nature and/or constituents. As you are probably aware, the handling of hazardous wastes is governed by regulations developed by the U.S. Environmental Protection Agency for the enforcement of the Resource Conservation and Recovery Act. As required by these regulations, specifically 40 CFR 264.37, Burlington Northern Railroad is submitting a copy of its contingency plan for emergencies at its Paradise Tie Treating Plant site. The purpose of this submission is to familiarize you with the plant layout, properties of the wastes stored at the plant, the location of specific hazards, fire access roads and routes, and mutual aid agreements, all of which are discussed in the contingency plan. Please note, the plan summarizes the hazardous wastes handled at the refinery, their hazardous characteristics, potential reactions, preventative measures to be taken against the hazards, and corrective measures to be taken should a problem occur.

Should you have any questions or desire further information, please contact Dave Thomas at 857-3303, in Somers, Montana. For your information, copies of this plan have been submitted to the following emergency departments and hospitals.

1) Plains Volunteer Fire Department
2) Sanders County Sheriff's Department
3) Paradise Volunteer Fire Department

Sincerely,

for

J. E. Daume
Chief Engineer - Region

MLB:bke

WORK:58

This section describes the efforts undertaken at the Paradise facility to prevent and be prepared for response to an emergency situation. This information is provided in accordance with 40 CFR 270.14(b)(6) and 40 CFR 264.30 through 264.37. A more detailed description of emergency procedures is provided in the Contingency Plan, Chapter 11.0 of this permit application.

10.1 Facility Design and Operation (40 CFR 264.31)

Details of the design and operation of the land treatment unit are provided in Section IV, Chapter 39.0 (Design, Operation and Maintenance Plan) of this permit application. It is important to note that the probability of a fire, explosion, or release of hazardous waste resulting in a potential threat to human health or the environment is remote because the waste being stored and treated at the Paradise site is non-combustible and non-reactive. Nevertheless, Burlington Northern has implemented procedures to ensure the health and safety of personnel on the plant site during construction and operation of the land treatment facility. These procedures are specified in the Contingency Plan (Chapter 11.0).

10.2 Equipment

10.2.1 Internal and External Communication Systems (40 CFR 264.32(a) and (b))

The Paradise Land Treatment Operations (Facility) Supervisor or his delegate will be the only individual on the site except when waste is being applied to the land treatment area. The Facility Supervisor will visit and inspect the land treatment area according to the Inspection Plan described in Chapter 9.0. Should any hazardous waste or hazardous constituents be released

from the land treatment facility, the released contaminant would not result in an immediate emergency to human health or the environment. Therefore, an internal alarm system in the plant is not necessary.

The Paradise Facility Supervisor will have a two-way radio in his vehicle during inspections of the Paradise site. This will enable summoning of assistance from the local emergency organizations.

10.2.2 Emergency Equipment (40 CFR 264.32(c))

Portable fire extinguishers, a first aid kit, and other emergency equipment will be maintained at the Paradise Railroad Depot or an on site trailer for emergencies. Details on the specifications, location, and operation of the emergency equipment are provided in the Table 11-3 in the Contingency Plan.

10.3 Equipment Testing and Maintenance (40 CFR 264.33)

A list of emergency equipment at the Paradise land treatment facility is provided in the Contingency Plan (Chapter 11.0). The inspection schedule is provided in the Inspection Plan (Chapter 9.0).

10.4 Access to Communication and Emergency Services (40 CFR 264.34)

Personnel on-site during inspections will have access to a two-way radio in their vehicle in order to summon external emergency assistance. A telephone is available at the Paradise Railroad Depot.

10.5 Required Aisle Space (40 CFR 264.35)

Sufficient space will remain around the land treatment area and between land treatment cells to enable the unobstructed movement of emergency equipment, e.g., fire-fighting vehicles. There will be a space of at least 20 feet between the perimeter of the actual land treatment area and the fence (Sheet Number 3 of the Paradise Land Treatment Construction Drawings). The aisles will be kept clear of obstructions at all times.

10.6 Arrangements with Local Authorities (40 CFR 264.37)

Burlington Northern has established coordination arrangements with local authorities and emergency services. A description of the organizations and their responsibilities is included in the Contingency Plan. The Paradise Volunteer Fire Department has been designated the primary emergency authority for the Paradise land treatment facility.

Burlington Northern will notify local authorities of the operation of the Paradise land treatment facility prior to its construction and solicit their assistance in responding to emergencies at the facility. Each of the applicable organizations will be provided a copy of the Contingency Plan when the land treatment facility is constructed.

12.0 GENERAL HAZARD PREVENTION-- Waste Pile

This section of the permit application is submitted in accordance with the requirements of [40 CFR 270.14(b)(8)]. This section describes the procedures, structures, and equipment used to prevent hazards at the Paradise Tie Treating Plant.

12.1 Operational Hazard Prevention [40 CFR 270.14(b)(8)(i)]

The ramps used by excavation equipment to move the wastes into the pile are constructed in such a way as to prevent contamination of soils outside the waste pile liner. Pieces of HDPE liner material have been placed on top of the waste pile berms outside the edge of the pile liner in order to completely cover the ground surface during the waste excavation and placement process. The ramps within the waste pile on top of the liner have been constructed by placing a minimum of 2 ft of soil (clean or contaminated) on top of the liner in lifts not to exceed 8 in. in uncompacted thickness, and compacting these lifts with a minimum of six complete passes of excavation equipment.

Track-mounted excavation equipment will be used to move the sludge and contaminated soils from the Paradise impoundment. A small bulldozer will push the sludge down the slough to the edge of the pile. A rubber-tired excavator will move the sludge from the staging area into the waste pile.

As the waste pile is located within the perimeter of the Paradise impoundment, no additional contamination should occur from the removal of wastes from this impoundment and placement within the waste pile. Excavation of the pipe that connected the plant to the impoundment will be undertaken by excavating the soils and pipe with a backhoe into a truck and transporting these materials to the waste pile. Every effort will be made to prevent the spread of contamination to adjacent areas during this operation. All areas contaminated by spillage or droppings will be excavated and placed within the waste pile.

12.2 Run-Off and Flood Prevention [40 CFR 270.14(b)(8)(ii)]

Run-on to the waste pile is controlled by waste pile berms and the impoundment drainage swales. The drainage swales have been designed by the Soil Conservation Service method to handle the 24-hour, 25-year storm. These swales discharge by gravity to the Clark Fork River.

Run-off from the waste pile is controlled through the leachate collection system. The leachate collection system is sloped to a cobble-filled sump designed to contain 5,000 gallons of fluid. During construction of the pile, should a rainstorm occur, leachate collected in the sump will be pumped into tank cars and treated at an approved facility. Since the pile will be covered after construction, only minor volumes of leachate are anticipated. If leachate is found, it will be pumped into 55-gallon drums and transported to an approved facility for treatment.

As stated in Section 15.2 of this permit application, the Paradise plant is located out of the 100-year floodplain.

12.3 Prevention of Water Supply Contamination [270.14(b)(8)(iii)]

The construction contractor will comply with applicable federal and state laws, orders, and regulations concerning the control and abatement of water pollution.

The contractor's construction activities will be performed by methods that will prevent entrance, or accidental spillage, of solid matter, contaminants, debris, and other objectionable pollutants and wastes into streams, water courses, lakes, and groundwater water sources. Such pollutants and wastes include, but are not restricted to refuse, garbage, cement, concrete, sewage effluent, industrial wastes, oil and other petroleum projects, mineral salts, and thermal pollution. Sanitary wastes will be disposed of on land by burial at approved sites or by other approved methods.

Dewatering work for earthwork operations will be conducted in a manner to prevent muddy water and eroded materials from entering water courses by construction of interceptor ditches, bypass channels, barriers, settling ponds, or by other approved means. Turbidity increases that are caused by construction activities will be limited to

the increases above the natural turbidities permitted under the state water quality standards.

Wastewaters from construction operations will not enter streams, watercourses, or other surface waters without the use of such turbidity control methods as settling ponds, gravel filter entrapment, dikes, approved flocculating processes which are not harmful to fish, recirculation systems for washing aggregates, or other approved methods. Any such wastewaters dishcarged into surface waters will be essentially free of settleable material; settleable material is defined as that which will settle from the water by gravity during a 1-hour quiescent detention period.

12.4 Mitigation of Equipment Failure and Power Outages [40 CFR 270.14(b)(8)(iv)]

The occurrence of equipment failure or an electrical power outage would not affect the operation of the waste pile nor cause the release of hazardous waste. As specified in Section 9.0 (Inspection Plan) of this permit application, the structures and equipment whithin the facility will be inspected regularly. If deficiencies are noted, the procedures specified in the Inspection Plan will be implemented.

If a failure in excavation equipment occurs during placement of waste in the pile, excavation would be halted until the equipment is repaired.

12.5 Prevention of Personnel Exposure to Hazardous Waste [CFR 270.14(b)(8)(v)]

A health and safety program has been established based on an analysis of potential hazards, and personnel protection measures have been selected that are commensurate with the potential risks. Procedures to be used while at the site and the personnel protective equipment required are defined in the health and safety program.

An evaluation of conditions at the site was made to determine the danger to personnel during construction of the waste pile. This evaluation was based on the following:

- Nature of the contaminants.
- Locations of the contaminants at the site.
- Potential for worker exposure during the various site activities.
- Effects of the contaminants on human health.

When in contact with the skin or eyes, creosote compounds can cause an irritation. Some of the compounds are photosensitizers (promote a rapid sunburn effect on the skin when the skin is exposed to the sun; the brighter the sun the more rapid and intense the skin effect). While prolonged and repeated skin contact can cause chronic skin disease, the potential is not to be considered a real potential for this short-term project, but is noted only to illustrate the real need for worker protection from skin contact of the creosote compounds. If a dust or aerosol is generated by this work, it should not be breathed when the worker's exposure is above the Occupational Safety and Health Administration's (OSHA) permissible exposure level of 0.2 milligrams per cubic meter benzene solubles for an 8-hour time (weighted average). This source is also a potential skin contact from airborne materials settling on the worker's exposed skin surfaces.

Vaporization and condensation of the volatile materials must be considered as a potential worker inhalation exposure. Inhalation of the vapor and/or condensation products from creosote compounds is irritating to the nose and throat. Therefore, worker respiratory protection may be required should the worker's exposure exceed the OSHA permissible exposure limits. The condensation product can also settle out or vapors can condense on the workers' exposed skin surface areas to cause skin irritation and the sunburn effect noted above. While prolonged and repeated inhalation exposures are not a potential for this project, such inhalation must be avoided where the potential exists.

The personnel protection program for the project includes employee health considerations, specifications for protective equipment, procedures for training of employees, and decontamination procedures.

Health Status. All employees are required to be in good health and able to use respiratory protection. Use of respiratory protection also requires that the employee pass an OSHA-type physical examination.

Protective Clothing. Full-length clothing protects against direct skin contact of creosote compounds, particles settling from the air, sunburn, and contributes to more comfortable working conditions by insulating the skin from high or low ambient temperatures.

Full-length clothing should be worn at all times. Wear long-sleeved shirts buttoned over the glove cuff. Wear long pants with close-fitting cuffs with trouser-length extending below top of work boot. Gloves should be tight-cuffed since contaminants may get inside gauntlet or flared cuff gloves.

Protective heavy-soled, above-ankle-height work boots should be worn. Safety shoes or metal foot protectors are recommended when handling heavy tools and equipment. Slip-resistant soles are also recommended.

Those potentially exposed to the possiblity of splashing and spurting of liquid contaminants should wear safety glasses or full-face protective equipment.

To prevent sunburn and lessen the severity of contact with hot materials, areas of exposed skin should be protected by water-soluble actinic-barrier creams such as:

Fend A-2

Mine Safety Appliances
400 Penn Center Boulevard
Pittsburgh, PA 15235

Kerodex 51

Ayerst Laboratories, Inc.
685 Third Avenue
New York, NY 11017

Ply-4

Milburn Co.
3246 East Woodbridge
Detroit, MI 48207

Hard hats will be worn when handling heavy tools or equipment.

Respiratory Protection. Air quality monitoring will be required while working in the impoundment and waste pile. If only dusts are generated and worker respiratory protection is required (OSHA Regulations 1910.1000 and 1910.134), MSHA/NIOSH approved dust, fume and

12.0 GENERAL HAZARD PREVENTION - Land Treatment Unit

This section of the permit application is submitted in accordance with the requirements of 40 CFR 270.14(b)(8). This section describes the procedures, structures, and equipment used to prevent hazards at the land treatment facility which will be operating near the location of the former Paradise Tie Treating Plant.

12.1 Operational Hazard Prevention (40 CFR 270.14(B)(8)(i))

The land treatment facility will be constructed on 27 acres of land located northwest of the present slough and south of the former Tie Treating Plant. A berm will be constructed around the perimeter of the facility, within the fence-line to prevent stormwater run-on from entering the facility and to contain stormwater run-off within the facility. The road area leading from the waste pile to the land treatment facility will be scraped clean at the end of each day's operation to remove any materials which have been dropped during transportation.

Ramps used by excavation equipment to move the waste from the waste pile will be constructed in such a way as to prevent contamination of soils outside the waste pile liner.

A rubber-tired excavator will move the sludge from the waste pile to the land treatment area. Care will be taken in the waste pile area to prevent damage to the waste pile liner.

12.2 Run-on, Run-off and Flood Prevention (40 CFR 270.14(B)(8)(ii))

Run-on to the land treatment facility will be controlled by a berm around the outside of the facility. This run-off from outside the facility berms will collect in the drainage swales around the waste pile and drain into the slough.

The land treatment subplots will be aligned with the natural slope of the land which is relatively flat. Runoff will not breach the perimeter dikes and will be contained within the perimeter of the land treatment facility.

As stated in Chapter 15.4 of this permit application, the proposed site of the land treatment facility at Paradise is not located in the 100-year floodplain of the Clark Fork River.

12.3 Prevention of Water Supply Contamination (270.14(B)(8)(iii))

The construction contractor will comply with applicable federal and state laws, orders, and regulations concerning the control and abatement of water pollution during the construction of the land treatment facility at Paradise.

The contractor's construction activities will be performed by methods that will prevent entrance or accidental spillage of solid matter, contaminants, debris, and other objectional pollutants and wastes into streams, water courses, lakes, and groundwater sources. Such pollutants and wastes include, but are not restricted to, refuse, garbage, cement, concrete, sewage effluent, industrial wastes, oil and other petroleum projects, mineral salts, and thermal pollution. Sanitary wastes will be disposed on land by burial at approved sites or by other approved methods.

Wastewaters from construction operation will not enter streams, watercourses, or other surface waters without the use of such turbidity control methods as settling ponds, gravel filter entrapment, dikes, approved flocculating processes which are not harmful to fish, recirculation systems for washing aggregates, or other approved methods. Any such wastewaters discharged into surface waters will be essentially free of settleable material; settleable material is defined as that which will settle from the water by gravity during a one-hour quiescent detention period.

skin is exposed to the sun; the brighter the sun the more rapid and intense the skin effect). While prolonged and repeated skin contact can cause chronic skin disease, the potential is not to be considered a real potential for this short-term project, but is noted only to illustrate the real need for worker protection from skin contact of the creosote compounds. If a dust or aerosol is generated by this work, it should not be breathed when the worker's exposure is above the Occupational Safety and Health Administrations (OSHA) permissible exposure lever of 0.2 milligrams per cubic meter benzene solubles for an eight hour time (weighted average) (29 CFR 1900). This source is also a potential skin contact from airborne materials settling on the worker's exposed skin surfaces.

Vaporization and condensation of the volatile materials must be considered as potential inhalation exposure. Inhalation of the vapor and/or condensation products from creosote compounds is irritating to the nose and throat. Therefore, worker respiratory protection may be required should the worker's exposure exceed the OSHA permissible exposure limits of 0.2 mg/m^3 benzene solubles. The condensation product can also settle out or vapors can condense on the workers' exposed skin surface areas to cause skin irritation and the sunburn effect noted above. While prolonged and repeated inhalation exposures are not a potential for this project, such inhalation must be avoided where the potential exists.

The personnel protection program for the project includes employee health consideration for protective equipment, procedures for training of employees, and decontamination procedures.

Health Status. All employees are required to be in good health and able to use respiratory protection. Use of respiratory protection also requires that the employee pass an OSHA-type physical examination.

Protective Clothing. Full-length clothing protects against direct skin contact of creosote compounds, particles settling from the air, sunburn, and contributes to more comfortable working conditions by insulating the skin from high or low ambient temperatures.

Full-length clothing should be worn at all times. Wear long-sleeved shirts buttoned over the glove cuff. Wear long pants with close-fitting cuffs with trouser length extending below top of work boot. Gloves should be tight-cuffed since contaminants may get inside gauntlet or flared cuff gloves.

Protective heavy-soled, above-ankle-height work boots should be worn. Safety shoes or metal foot protectors are recommended when handling heavy tools and equipment. Slip-resistant soles are also recommended.

Those potentially exposed to the possibility of splashing and spurting of liquid contaminants should wear safety glasses or full-face protective equipment.

To prevent sunburn and lessen the severity of contact with hot materials, areas of exposed skin should be protected by water-soluble actinic-barrier creams such as:

Fend A-2
Mine Safety Appliances
400 Penn Center Boulevard
Pittsburgh, PA 15235

Kerodex 51
Ayerst Laboratories, Inc.
685 Third Avenue
New York, NY 11017

Ply-4
Milburn Co.
3246 East Woodbridge
Detroit, MI 48207

Hard hats will be worn when handling heavy tools or equipment.

Respiratory Protection. If only dusts are generated and worker respiratory protection is required (OSHA regulations 1910.1000 and 1910.134), MSHA/NIOSH approved dust, fume and mist respirators can be used in accordance with the manufacturer's

instructions. These units require a MSHA/NIOSH TC-21C approval number.

If the creosote compounds generate vapors and aerosols and worker respiratory protection is required (OSHA Regulations 1910.1000 and 1910.134), units with MSHA/NIOSH approval number TC-23C-161 must be worn by the workers. The type of respiratory unit required depends on the actual exposure to the workers and it must be used as per the manufacturer's instructions.

Training. All employees will be briefed on procedures prior to their working on the site (see Section 16.0). Training will include:

- Proper material handling,
- Proper sampling procedure,
- Maintenance of safety equipment,
- Requirements for and use of respirators and personal protection equipment,
- Required personal hygiene practices,
- Effective response to any emergency,
- Responses to fires and explosions,
- Emergency procedures,
- Hazard zones,
- Decontamination methods, and
- General safety precautions.

Decontamination. Administrative procedure require hygienic practices consistent with work hazards. Employees will be instructed in the training program on proper personal hygiene procedures.

Contaminated equipment will be decontaminated prior to leaving the site. Shovels, steam cleaners, or air jets will be used to remove contaminated material. Wastewater generated by

decontamination procedure will be collected in one of the run-off ponds and treated by spray irrigation.

13.0 IGNITION/REACTION PRECAUTIONS -- Waste Pile

This section of the permit application addresses the need for precautions to prevent accidental ignition or reaction of ignitable, reactive, or incompatible wastes in compliance with [40 CFR Parts 270.14(b)(9), 270.18(g) and (h), 264.17, 264.256, and 264.257].

The creosote waste stored at the Paradise site, classified by EPA as wood preservation: K001, is not considered an ignitable or reactive waste [40 CFR 261.32]. Therefore, special precautions to prevent accidental ignition or reaction are not necessary.

The waste to be stored in the waste pile is homogeneous, consisting of creosote-contaminated soil and sludge, so potential reactive problems associated with the mixing of imcompatible wastes will not occur.

13.0 IGNITION/REACTION PRECAUTIONS -- Land Treatment Uni

This section of the permit application addresses the need for precautions to prevent accidental ignition or reaction of ignitable, reactive, or incompatible wastes in compliance with 40 CFR 270.14(b)(9) and 264.17.

The creosote contaminated waste stored at the Somers and Paradise sites are classified by the U.S. EPA as waste from wood preserving processes and are identified by the Hazardous Waste Number K001. These wastes are not considered an ignitable or reactive waste according to 40 CFR 261 Subpart C. Therefore, special precautions to prevent accidental ignition or reaction are not necessary.

The wastes to be land treated are homogeneous, consisting of soil and sludge contaminated with creosote, so potential reactive problems associated with the mixing of incompatible wastes will not occur.

14.0 TRAFFIC CONTROL-- Waste Pile

This section of the permit application includes the traffic-related information required in [40 CFR 270.14(b)(10)]. As specified in the EPA guidance manual for 40 CFR 264, traffic information is required only for the area inside and immediately surrounding the hazardous waste management facility.

It is important to note that once the construction of the waste pile and excavation of the waste from the impoundments at Paradise and Somers has been completed, no traffic will occur within the Paradise site. The only person authorized to enter the site will be the Plant Supervisor to conduct periodic inspections (see Section 9.0).

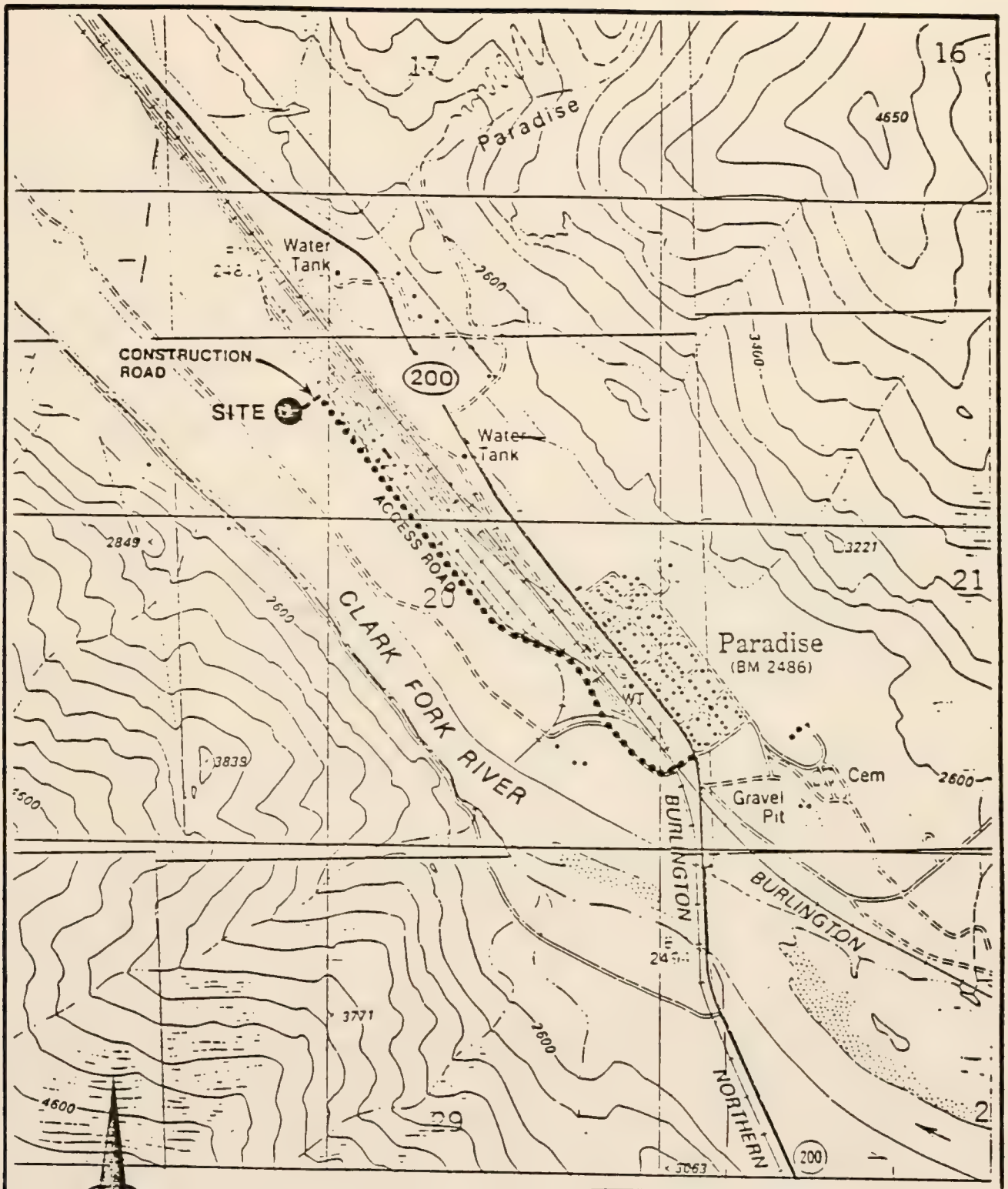
14.1 Training Procedures

Truck drivers responsible for the transport of waste from Somers to Paradise will receive training at a meeting prior to the transport operation (see Section 16.0, Personnel Training). The training will include:

1. Travel route from Somers to Paradise
2. Site plan of Paradise, indicating location of access roads, waste pile ramps, parking areas.
3. Unloading procedures
4. Decontamination procedures
5. Personnel protection measures

14.2 Transportation Routes

The storage of creosote wastes from the Somers Tie Treating Plant will entail transport of approximately 4,100 cubic yards of waste to Paradise from Somers. Figure 14-1 shows the roadways in the vicinity of the Paradise facility. The roadways within the site are shown on Figure 5-2, the Site Plan. State Highway 200 is a two-lane undivided roadway. The access road to the site from State Highway 200 is a gravel road. It is a lightly traveled road throughout the day; it is not a school bus route. The load-bearing capacity of the roads is determined by the registered weight of the vehicle. The maximum load



B.N. PARADISE PART B

AREA ROADS

D-896

14-1

14-2

14.0 TRAFFIC CONTROL - Land Treatment Unit

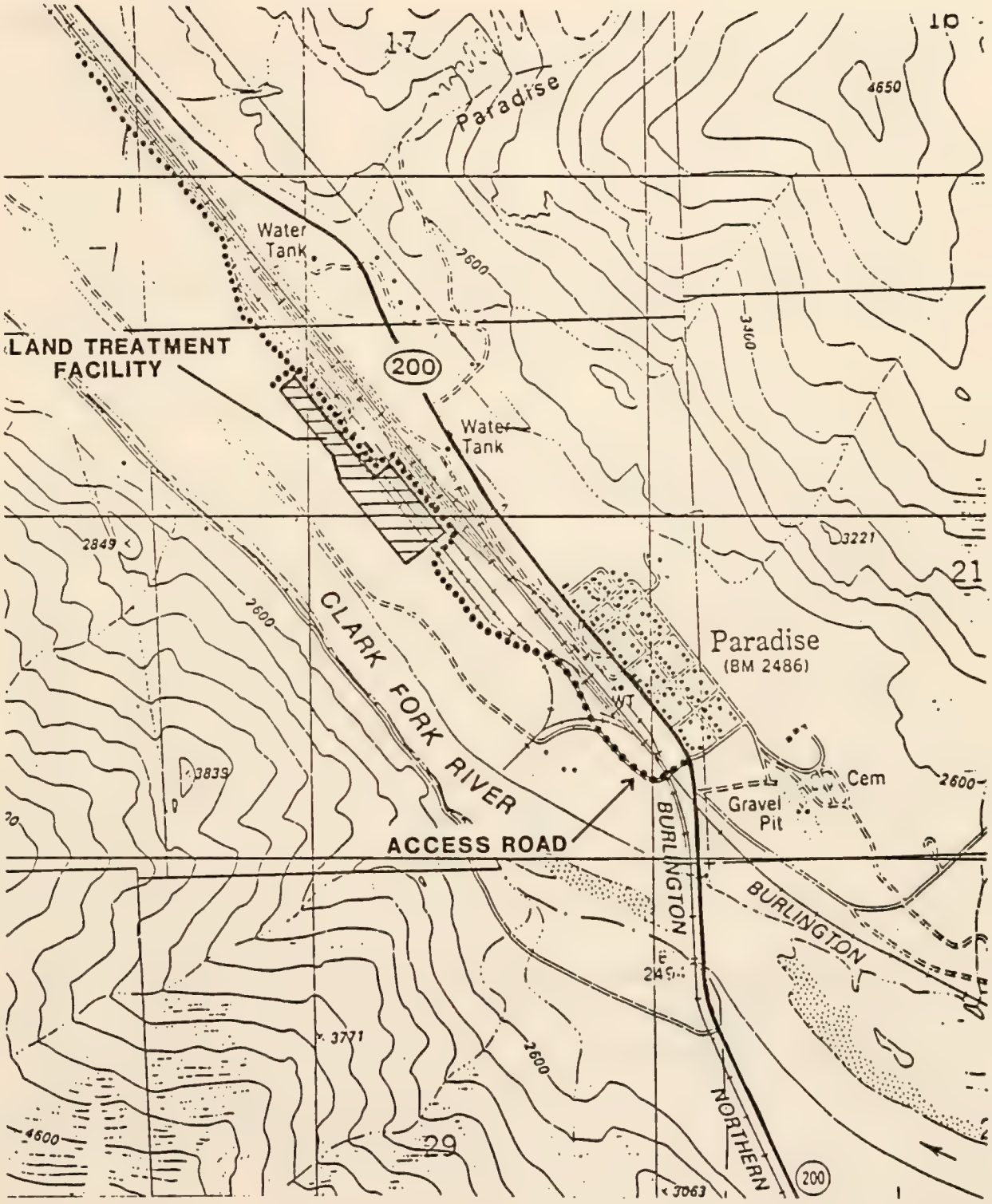
This section of the permit application includes the traffic-related information required in 40 CFR 270.14(b)(10). The information presented includes data on the traffic pattern, traffic control, and traffic volume. At the present time, the Paradise Facility is closed and the only person authorized to enter the site is the Plant Supervisor who conducts periodic inspections. Therefore, plant traffic is currently negligible.

14.1 Paradise Traffic Control

Figure 14-1 depicts the roadways in the general vicinity of the Paradise Facility. Access to the facility is gained via Montana State Highway 200, which is a two-lane undivided asphalt road. The load-bearing capacity of Montana Highways is controlled by the Montana Department of Highways, which allows a maximum load of 80,000 pounds, unless a special permit is obtained.

The access road leading from State Highway 200 to the facility is a two-way gravel road and the construction road leading from the access road to the waste pile is a two-way dirt road. Both the access road and construction road have an adequate load-bearing capacity to support truck loads as evidenced by their use in the past by dump trucks loaded with waste arriving from Somers.

A rubber-tired front end loader and dump trucks will be used to transport the waste from the waste pile to the land treatment area via the construction road. The vehicles transporting the waste materials will enter the fenced land treatment area through a gate on the southeast side. No other vehicles will be permitted to use this gate or the road leading from the waste pile to the land treatment facility. Vehicle collisions are highly unlikely because less than four dump trucks will travel the construction road between the waste pile and the land



BN PARADISE LAND TREATMENT FACILITY AREA ROADS

FIGURE 14-1

treatment facility at any given time. All other vehicular traffic will be confined to travelling along the access road. This traffic will generally consist of a few passenger cars and light trucks which will be used by the land treatment operations supervisor and inspectors.

Traffic controls at the Paradise site consist of locked gates at the entrance to the access road from State Highway 200 and at the construction road leading from the waste pile, and a posted facility speed limit of 10 miles per hour.

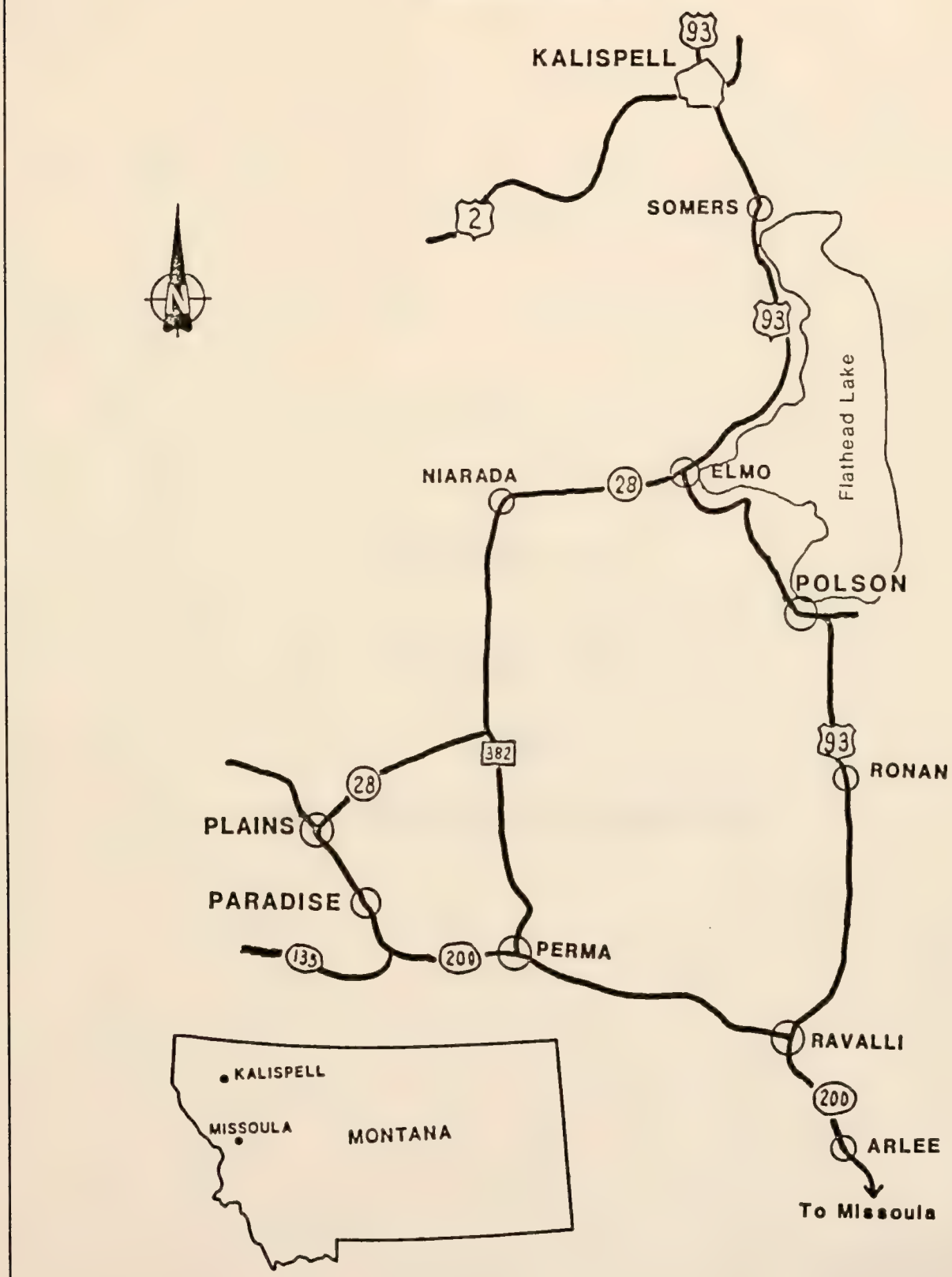
14.2 Somers Traffic Route

In the event that additional wastes are transported from the former BN Tie Treating Plant at Somers, Montana to the proposed BN Paradise Land Treatment facility, a specific travel route will be used. Figure 14-2 depicts the roadways to be used in transportation of wastes from Somers to Paradise.

Trucks hauling the creosote contaminated soils will travel from the Somers site to Paradise via US Highway 93 south to Elmo, then via State Highway 28 south to Plains, then via State Highway 200 east to Paradise. This entire route is a two-lane undivided asphalt paved road. The travel distance per highway is as follows: US Highway 93, 27 miles; State Highway 28, 47 miles; and State Highway 200, 4 miles. Total travel distance is 78 miles.

Other shipping specifics such as number and type of vehicles, load size, and frequency of trips is not known at this time. The exact quantity of waste to be shipped from Somers, if any, will not be known until the Record of Decision for the CERCLA cleanup at Somers is finalized.

REIEC



SOMERS-PARADISE TRUCKING ROUTE

FIGURE 14-2

ATTACHMENT II.6.

CONTINGENCY PLAN

FOR THE

WASTE PILE AND LAND TREATMENT UNITS

11.0 CONTINGENCY PLAN -- Waste Pile

The information in this Contingency Plan is submitted in accordance with the requirements of [40 CFR Part 264, Subpart D and 270.14(b)(7)]. The location of Subpart D requirements in the Contingency Plan are identified in Table 11-1.

This Contingency Plan is for the Burlington Northern Railroad Paradise Tie Treating Plant, located at Paradise, Montana. The Paradise plant is an abandoned facility that treated railroad ties with creosote preservative.

This Contingency Plan presents systematic procedures for immediate response to potential emergencies. The Contingency Plan will enable emergency coordinators to act quickly and efficiently to minimize human health hazards and adverse environmental effects.

11.1 General Facility Information

The hazardous waste management facility at the Paradise plant consists of a lined waste pile for the storage of creosote wastes. The dimensions of the waste pile are 150 ft by 300 ft. The pile has a synthetic double-liner system including a leachate collection system and a leak detection system. The entire pile has a synthetic cover to prevent wind dispersal and to control run-off. A site plan of the Paradise plant showing the location of the waste pile is provided in Figure 11-1.

11.2 Emergency Coordinators

If an emergency situation develops at the Paradise plant, sighs around the perimeter of the facility instruct the person discovering the emergency to contact Mel Burda, the Emergency Coordinator. The Emergency Coordinator's phone number is provided on the sign. In addition, Mel Burda's office and home phone numbers have been given to the Paradise and Plains fire departments and the Sanders County Sheriff's Department with copies of the Contingency Plan, in case they are notified first.

Table 11-2 lists the Emergency Coordinators and the organizations that can be contacted in case of emergency. Table 11-2 is contained in all copies of the Contingency Plan.

TABLE 11-1

LOCATION OF 40 CFR 264 SUBPART D
REQUIREMENTS IN CONTINGENCY PLAN

Subpart D Requirement	Location in Contingency Plan
Purpose and Implementation (264.51)	11.0 Introduction
Content of Contingency Plan (264.52)	11.0 Introduction
Emergency Actions (a)	11.4 Emergency Response Procedures
Amendments of SPCC (b)	11.9 Amendment of Contingency Plan
Coordinated Emergency Services (c)	11.6 Coordinated Emergency Services
Emergency Coodinators (d)	11.2 Emergency Coordinators
Emergency Equipment (e)	11.5 Emergency Equipment
Evacuation Plan (f)	11.7 Evacuation Plan
Copies of Contingency Plan (264.53)	11.8 Copies of Contingency Plan
Amendment of Contingency Plan (264.54)	11.9 Amendment of Contingency Plan
Emergency Coordinator (264.55)	11.2 Emergency Coordinators
Emergency Procedures (264.56)	11.4 Emergency Response Procedures

Attachment I.6

TABLE 11-2

PLANT EMERGENCY COORDINATORS AND EMERGENCY RESPONSE TEAM

Date: 10/27/88

Emergency Coordinators		Phone Number
Mel Burda		(913) 661-4439
Emergency Response Team	**Responsibility**	
Paradise Volunteer Fire Department (Primary)	Firefighting, explosion	826-3597
Plains Volunteer Fire Department (Back-up)	Firefighting, explosion	826-3601
Sanders County Sheriff's Department (Thompson Falls)	Public evacuation, Traffic control, Security	827-3584
Clark Fork Valley Hospital	Personal injury	826-3601
Ambulance (Clark Fork Valley Hospital)	Personal injury	826-3601
Paradise Railroad Depot	Emergency equipment	826-3733
Emergency Notification		
Montana Solid and Hazardous Waste Bureau		444-2821
EPA Region VIII, Montana Office		449-5414
Montana Disaster and Emergency Services		444-6911
EPA Emergency Response		1-800-293-1788
National Response Center		1-800-424-8802

Mel Burda has been selected as the Emergency Coordinator due to his familiarity with the Paradise plant and his knowledge of the physical and chemical properties of creosote. Mr. Burda has been with Burlington Northern since 1970 and has been involved with the Paradise Tie Plant since 1982. He has the authority to commit the resources necessary to implement the Contingency Plan. Mr. Burda is located in the Burlington Northern's Overland Park, Kansas division office.

11.3 Implementation of the Contingency Plan

The possibility of an emergency situation developing from the operation of the waste pile which would endanger human health or the environment outside of the facility is very remote because waste will not be added to the pile once construction is complete.

The Contingency Plan will be implemented when an imminent or actual incident could threaten human health or the environment. Potential incidents are: (1) fire and/or explosion, (2) release of hazardous waste.

11.3.1 Fire and/or Explosion

- Fire within the site that threatens the waste pile and where intense heat could ignite and/or release hazardous waste or hazardous waste constituents.
- Fire outside the site that threatens the plant property and could ignite and/or release hazardous waste or hazardous waste constituents.
- Explosion where fragments or shock waves damage the waste pile resulting in the ignition and/or release of hazardous waste or hazardous waste constituents.

11.3.2 Release of Hazardous Waste

- Breaching of the waste pile resulting in the release of hazardous waste or hazardous waste constituents.
- Erosion or structural damage of berms or drainage swales resulting in the release of hazardous waste or hazardous waste constituents.

11.4 Emergency Response Procedures

11.4.1 General Procedures

The following procedures will be implemented by the Emergency Coordinator upon the occurrence of any emergency situation which threatens human health or the environment [40 CFR 264.56].

1. Notify appropriate state or local organizations if their help is needed. The roles of the various organizations are specified in Table 11-2 of the Contingency Plan.

2. Assess the possible hazards to human health or the environment that may result from a fire, explosion, or release. The assessment will include both direct and indirect effects (e.g., effects of any hazardous surface water run-off from the use of chemical fire retardants).

3. An evacuation of the local area is unlikely to be necessary due to the lack of residential properties in the immediate area and because the waste is not ignitable or reactive. If an evacuation should be necessary, the Emergency Coordinator will notify the Paradise Volunteer Fire Department and the Sanders County Sheriff's Department. He will then be available to help direct the evacuation.

4. Immediately notify the government official designated as the on-scene coordinator for this area (in the regional contingency plan under [40 CFR Part 1510] or the National Response Center (at 800-424-8802). The report will include:

   - Name and telephone number of reporter;
   - Name and address of facility;
   - Time and type of incident (e.g., release, fire);
   - Name and quantity of materials involved, to the extent known;
   - The extent of injuries, if any; and
   - The possible hazards to human health or the environment outside the facility.

5. Take all reasonable measures necessary to ensure that fires, explosions, and/or releases do not occur, recur, or spread to other parts of the facility. These measures will include, where applicable, collecting and containing released waste and removing or isolating containers.

6. Monitor for leaks from the waste pile. The waste pile is not "operating"; it functions as a storage area for hazardous waste. Therefore, an emergency situation will not cause pressure build-up, gas generation, or ruptures in valves, pipes, or other equipment.

7. Immediately after an emergency, the Emergency Coordinator will provide for treating, storing, or disposing of recovered waste, contaminated soil or surface water, or any other material that results form a release, fire, or explosion at the facility. (Note: Unless it can be demonstrated, in accordance with 40 CFR 261.3 (c) and (d), that the recovered material is not a hazardous waste, the recovered material becomes a hazardous waste and must be managed in accordance with all applicable requirements of the regulations).

8. Ensure that in the affected area(s) of the facility:

   - No waste that may be incompatible with the released material is treated, stored, or disposed of until clean-up procedures are completed; and

   - All emergency equipment listed in the contingency plan is cleaned and fit for its intended use.

9. Notify the U.S. EPA Regional Administrator, the Montana Department of Health and Environmental Sciences, and other appropriate state and local authorities, that the requirements of paragraph 8 above, have been complied with (see Table 11-2).

10. Note in the facility operating record the time, date, and details of any incident that requires implementation of the contingency plan. Within 15 days after the incident, he must submit a written report on the incident to the U.S. EPA Regional Administrator and Montana Department of Health and Environmental Sciences. The report must include:

    1) Name, address, and telephone number of the owner or operator;

    2) Name, address, and telephone number of the facility;

    3) Date, time and type of incident (e.g., fire, explosion);

    4) Name and quantity of material(s) involved;

    5) The extent of injuries, if any;

    6) An assessment of actual or potential hazards to human health or the environment, where this is applicable; and,

    7) Estimated quantity and disposition of recovered material that resulted from the incident.

11.4.2 Personal Injuries

The health and safety program has been established to allow site operations to be conducted without adverse impacts on worker health and safety (see Section 12.0, General Hazard Prevention). In addition, supplementary emergency response procedures have been developed to cover extraordinary conditions at the site.

General Emergency Procedures. All accidents and unusual events will be dealt with in a manner to minimize a continued health risk to site workers. In the event that an accident or other unusual event occurs, the following procedure will be followed:

- First aid or other appropriate initial action will be administered by those closest to the accident/event. This assistance will be conducted so that those rendering assistance are not placed in a situation of unacceptable risk.
- All accidents/unusual events must be reported to the Plant Supervisor who is responsible for conducting the emergency response in an efficient, rapid, and safe manner. The plant manager or the designated foreman will decide if off-site assistance and/or medical treatment is required and arrange for assistance.
- All workers on site should conduct themselves in a mature, calm manner in the event of an accident/unusual event. All personnel must conduct themselves to avoid spreading the danger to themselves and surrounding workers.

Responses to Specific Situations. Emergency procedures for specific situations are given in the following paragraphs.

If an employee working in a contaminated area is physically injured, Red Cross first-aid procedures will be followed. Depending on the severity of the injury, emergency medical response may be sought. If the employee can be moved, he will be taken to the edge of the work area (on a stretcher, if needed) where contaminated clothing will be removed, emergency first aid administered, and transportation to a local emergency medical facility awaited.

If the injury to the worker is chemical in nature (e.g., over-exposure), the following first aid procedures are to be instituted:

- Eye Exposure - If contaminated solids or liquids get into the eyes, wash eyes immediately with appropriate solution and lifting the lower and upper lids occasionally. Obtain medical attention immediately.

- Skin Exposure - If contaminated solids or liquids get on the skin, promptly wash the contaminated skin using soap or mild detergent and water. Obtain medical attention immediately when exposed to concentrated solids or liquids. If a skin burn occurs from contact with hot creosote, saturate the skin burn with water but do no attempt to remove the creosote. Apply cold water sterile dressing loosely over the burned area and obtain medical attention as soon as possible.

- Breathing - If a person inhales large amounts of a toxic vapor, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Obtain medical attention as soon as possible.

- Swallowing - When contaminated solids or liquids have been swallowed, the Poison Control Center will be contacted and their recommended procedures followed.

11.4.3 Fire and/or Explosion

1. The Plant Supervisor will serve as the Emergency Coordinator.

2. If a localized fire occurs, chemical fire extinguishers will be used. If necessary and feasible, a fire blanket, soil, or other inert materials should be placed on the burning area to extinguish the flames and minimize the potential for spreading. Water or foam should not be used.

3. The Emergency Coordinator will decide whether to summon the Paradise Volunteer Fire Department for assistance.

11.4.4 Material Release

If an observer discovers a spill involving a breaching of the waste pile, signs surrounding the facility will direct the observer to call the Emergency Coordinator.

1. The Emergency Coordinator will direct the clean-up of the hazardous material released from the waste pile utilizing appropriate clothing, shovels, brooms and front-end loaders. The waste will be redeposited in the waste pile.

2. A hole in the waste pile will be repaired by placing scraps of the lining over the hole and securing the repaired area with sand bags.

3. Clean-up equipment will be cleaned or placed in drums for proper disposal.

11.5 Emergency Equipment [40 CFR 264.52(e)]

The emergency equipment listed in Table 11-3 is available at the Paradise Railroad Depot. This equipment will be available onsite when personnel are involved in moving equipment or waste into or out of the Paradise plant.

11.6 Coordinated Emergency Services [40 CFR 264.52(c)]

Burlington Northern has made the following arrangements with the local authorities listed in Table 11-2 for responding to emergency situations.

Each of the organizations on the Emergency Response Team (Table 11-2) have been provided with copies of the Contingency Plan. The Paradise Volunteer Fire Department is the primary emergency authority for the Paradise plant. The Emergency Coordinator is responsible for initiating contact with the responsible organizations. The Emergency Coordinator will contact the National Response Center (1-800-424-8802) in the event the facility has a fire, explosion, or release which could threaten human health or the environment.

11.7 Evacuation Plan [40 CFR 264.52(f)]

An evacuation plan is not required for the Paradise Tie Treating Plant itself as no personnel will be on site following construction of the waste pile.

11.8 Copies of Contingency Plan [40 CFR 264.53]

The Contingency Plan is maintained by the organizations listed in Table 11-2.

11.9 Amendment of Contingency Plan [40 CFR 264.54]

The Contingency Plan will be reviewed and amended, if necessary, whenever:

1) The facility permit is revised;

2) Deficiencies are noted during an emergency;

Attachment II.6

TABLE 11-3

EMERGENCY EQUIPMENT

Equipment	Quantity	Description	Location
Fire Extinguishers	4	Dry Chemical	Paradise Site Office
Fire Hydrants	4		SE of retort house along access road; 400 feet apart
Respirators	3	Organic, double element	Paradise Site Office
Eye Wash	2	Olive oil emollient	Paradise Site Office
Protective Skin Cream	6	Kerodex #51	Paradise Site Office
First Aid Kit	1		Paradise Site Office
Protective Clothing	2	Rubberized suits	Paradise Site Office
	3	Tyvek suits	Paradise Site Office
	12	Poly glove pairs	Paradise Site Office

3) The facility design, construction, operation, maintenance, or other circumstances change in a way that increases the potential for fires, explosion, or releases of hazardous waste or hazardous waste constituents, or changes the response necessary in an emergency;

4) The list of emergency coordinators changes; or

5) The list of emergency equipment changes.

11.0 CONTINGENCY PLAN - Land Treatment Unit

The information in this Contingency Plan is submitted in accordance with the requirements of 40 CFR 264 Subpart D and 270.14(b)(7). The location of Subpart D requirements in the Contingency Plan are identified in Table 11-1.

This Contingency Plan is for the land treatment facility at the Burlington Northern facility located at Paradise, Montana. The site is an abandoned facility that treated railroad ties with creosote preservative.

This Contingency Plan presents systematic procedures for immediate response to potential emergencies. The Contingency Plan will enable emergency coordinators to act quickly and efficiently to minimize human health hazards and adverse environmental effects.

11.1 General Facility Information

The hazardous waste management facility proposed for the Paradise site is a land treatment unit which will treat, degrade or immobilize the hazardous waste constituents of the creosote sludges and contaminated soils. The land treatment unit will be constructed on 28 acres located in the SW ¼ of Section 17 and the NW ¼ of Section 20, Township 19 North, Range 25 West (Sheet Number 2 and 3 of the Paradise Land Treatment Construction Drawings).

11.2 Emergency Coordinators

The Primary Emergency Coordinator for the land treatment facility will be the facility operator. The facility operator will be responsible for all emergency and safety requirements of the permit in addition to daily facility operations of the proposed land treatment facility and the waste pile. He will have the authority to commit the resources necessary to implement

TABLE 11-1

LOCATION OF 40 CFR 264 SUBPART D REQUIREMENTS IN CONTINGENCY PLAN

Subpart D Requirement	Location in Contingency Plan	
Purpose and Implementation (264.51)	11.0	Introduction
Content of Contingency Plan (264.52)	11.0	Introduction
Emergency Actions (a)	11.4	Emergency Response Procedures
Amendments of SPCC (b)	11.9	Amendment of Contingency Plan
Coordinated Emergency Services (c)	11.6	Coordinated Emergency Services
Emergency Coordinators (d)	11.2	Emergency Coordinator
Emergency Equipment (e)	11.5	Emergency Equipment
Evacuation Plan (f)	11.7	Evacuation Plan
Copies of Contingency Plan (264.53)	11.8	Copies of Contingency Plan
Amendment of Contingency Plan(264.54)	11.9	Amendment of Contingency Plan
Emergency Coordinator (264.55)	11.2	Emergency Coordinator
Emergency Procedures (264.56)	11.4	Emergency Response Procedures

the Contingency Plan. This facility operator will be hired to operate these two facilities if the land treatment permit is issued and will be located in Paradise. Mr. Mel Burda is the designated Alternate Emergency Coordinator for the Paradise Plant. Mr. Burda, the regional environmental engineer is located in Burlington Northern's Overland Park, Kansas office.

Table 11-2 lists the Emergency Coordinators and the organizations that can be contacted in case of emergency. Table 11-2 will be contained in all copies of the Contingency Plan.

11.3 Implementation of the Contingency Plan

The Contingency Plan will be implemented when an imminent or actual incident could threaten human health or the environment. Potential incidents are: (1) fire and/or explosion, (2) release of hazardous waste as described below.

11.3.1 Fire and/or Explosion

- Fire within the site that threatens the land treatment area and where intense heat could ignite and/or release hazardous waste or hazardous waste constituents.
- Fire outside the site that threatens the plant property and could ignite and/or release hazardous waste or hazardous waste constituents.
- Explosion where fragments or shock waves damage the land treatment area resulting in the ignition and/or release of hazardous waste or hazardous waste constituents.

11.3.2 Release of Hazardous Waste

- Erosion or structural damage of berms resulting in the release of hazardous waste or hazardous waste constituents.

TABLE 11-2

EMERGENCY COORDINATORS AND EMERGENCY RESPONSE TEAM

Emergency Coordinators

Paradise Facility Operator	
Mel Burda (Alternate Coordinator)	913-661-4439

Emergency Response Team

Firefighting, explosion	
- Paradise Volunteer Fire Department	826-3597
- Plains Volunteer Fire Department (back-up)	826-3601
Public evacuation, traffic control, security	
- Sanders County Sheriff's Department	827-3584
Personal injury	
- Clark Fork Valley Hospital	826-3601
- Ambulance (Clark Fork Valley Hospital)	826-3601
Emergency Equipment	
- Paradise Site Office	

Emergency Notification

Montana Solid and Hazardous Waste Bureau	444-2821
EPA Region VIII, Montana Office	449-5414
Montana Disaster and Emergency Services	444-6911
EPA Emergency Response	1-800-293-1788
National Response Center	1-800-424-8802

11.4 Emergency Response Procedures

11.4.1 General procedures

The following procedures will be implemented by the Emergency Coordinator upon the occurrence of any emergency situation which threatens human health or the environment (40 CFR 264.56).

1) Notify appropriate state or local organizations if their help is needed.

2) Assess the possible hazards to human health or the environment that may result from a fire, explosion, or release. The assessment will include both direct and indirect effects (e.g., effects of any hazardous surface water run-off from the use of chemical fire retardants).

3) An evacuation of the local area is unlikely to be necessary due to the lack of residential properties in the immediate area and because the waste is not ignitable or reactive. If an evacuation should be necessary, the Emergency Coordinator for the land treatment facility will notify the Paradise Volunteer Fire Department and the Sanders County Sheriff Department. He will then be available to help direct the evacuation.

4) Immediately notify the government official designated as the on-scene coordinator for this area (in the regional contingency plan under 40 CFR Part 1510 or the National Response Center at 800-424-8802). The report will include:

   - Name and telephone number of report;
   - Name and address of facility;
   - Time and type of incident (e.g., release, fire);
   - Name and quantity of materials involved, to the extent known;
   - The extent of injuries, if any; and
   - The possible hazards to human health or the environment outside the facility.

5) Take all reasonable measures necessary to ensure that fires, explosions and/or releases do not occur, recur, or spread to other parts of the facility. These measures will include, where applicable, collecting and containing released waste and removing or isolating containers.

6) Monitor for discharges from the land treatment facility and associated operations which may result in an emergency situation.

7) Immediately after an emergency, the Emergency Coordinator will provide for treating, storing, or disposing of recovered waste, contaminated soil or surface water, or any other material that results from a release, fire, or explosion at the facility, (Note: Unless it can be demonstrated, in accordance with 40 CFR 261.3(c) and 261.3(d), that the recovered material is not a hazardous waste and must be managed in accordance with all applicable requirements of the regulations).

8) Ensure that in the affected area(s) of the facility:

   - No waste that may be incompatible with the released material is treated, stored, or disposed of until clean-up procedures are completed; and

   - All emergency equipment listed in the contingency plan is cleaned and fit for its intended use.

9) Notify the U.S. EPA Regional Administrator, the Montana Department of Health and Environmental Sciences, and other appropriate state and local authorities, that the requirements of paragraph 8 above, have been complied with (see Table 11-2).

10) Note in the facility operating record the time, date, and details of any incident that requires implementation of the Contingency Plan. Within 15 days after the incident, he must submit a written report on the incident to the U.S. EPA Regional Administrator and Montana Department of Health and Environmental Sciences. The report must include:

   - Name address, and telephone number of the owner of operator;

   - Name address, and telephone number of the facility;

- Date, time and type of incident (e.g., fire, explosion);
- Name and quantity of material(s) involved;
- The extent of injuries, if any:
- An assessment of actual or potential hazards to human health or the environment, where this is applicable; and,
- Estimated quantity and disposition of recovered material that resulted from the incident.

11.4.2 Personal Injuries

The health and safety program has been established to allow site operations to be conducted without adverse impacts on worker health and safety (see Chapter 12.0, General Hazard Prevention). In addition, supplementary emergency response procedures have been developed to cover extraordinary conditions at the site.

General Emergency Procedures. All accidents and unusual events will be dealt with in a manner to minimize a continued health risk to site workers. In the event that an accident or other unusual event occurs, the following procedure will be followed:

- o First aid or other appropriate initial action will be administered by those closest to the accident/event. This assistance will be conducted so that those rendering assistance are not placed in a situation of unacceptable risk.
- o All accidents and unusual events must be reported to the Emergency Coordinator who is responsible for conducting the emergency response in an efficient, rapid, and safe manner. The Emergency Coordinator will decide if off-site assistance and/or medical treatment is required and arrange for assistance.

- All workers on site should conduct themselves in a mature, calm manner in the event of an accident/unusual event. All personnel must conduct themselves to avoid spreading the danger to themselves and surrounding workers.

Responses to Specific Situations. Emergency procedures for specific situations are given in the following paragraphs.

If an employee working in a contaminated area is physically injured, Red Cross first-aid procedures will be followed. Depending on the severity of the injury, emergency medical response may be sought. If the employee can be moved, he will be taken to the edge of the work area (on a stretcher, if needed) where contaminated clothing will be removed, emergency first aid administered, and transportation to a local emergency medical facility awaited.

If the injury to the worker is chemical in nature (e.g., over-exposure), the following first aid procedures are to be instituted:

- Eye Exposure - If contaminated solids or liquids get into the eyes, wash eyes immediately with appropriate solution and lifting the lower and upper lids occasionally. Obtain medical attention immediately.

- Skin Exposure - If contaminated solids or liquids get on the skin promptly wash the contaminated skin using soap or mild detergent and water. Obtain medical attention immediately when exposed to concentrated solids or liquids. If a skin burn occurs from contact with hot creosote, saturate the skin burn with water but do not attempt to remove the creosote. Apply cold water sterile dressing loosely over the burned area and obtain medical attention as soon as possible.

- Breathing - If a person inhales large amounts of a toxic vapor, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Obtain medical attention as soon as possible.

- Swallowing - When contaminated solids or liquids have been swallowed, the Poison Control Center will be contacted and their recommended procedures followed.

11.4.3 Fire/and or Explosion

1) If a localized fire occurs, chemical fire extinguishers will be used. If necessary and feasible, a fire blanket, soil or other inert materials should be placed on the burning area to extinguish the flames and minimize the potential for spreading. Water or foam should not be used.

2) The Emergency Coordinator will decide whether to summon the Paradise Volunteer Fire Department for assistance.

11.5 Emergency Equipment (40 CFR 264.52(c))

The emergency equipment listed in Table 11-3 will be available at the Paradise Railroad Depot or an on site trailer. This equipment will be available on-site when personnel are involved in the operation of the Paradise land treatment facility.

11.6 Coordinated Emergency Services (40 CFR 264.52(c))

Burlington Northern will make arrangements with the local authorities listed in Table 11-2 for responding to emergency situations.

Each of the organizations on the Emergency Response Team (Table 11-2) will be provided with copies of the Contingency Plan. The Paradise Volunteer Fire Department is the primary emergency authority for the Paradise plant. The Emergency Coordinator is responsible for initiating contact with the responsible organizations. The Emergency Coordinator will contact the National Response Center (1-800-424-8802) in the event the facility has a fire, explosion, or release which could threaten human health or the environment.

TABLE 11-3

LIST OF EMERGENCY EQUIPMENT IN PARADISE RAILROAD DEPOT

Equipment	Description	Quantity
Fire Extinguishers	Dry chemical	4
Respirators	Organic, double element	3
Eye Wash	Olive oil emollient	2
Protective Skin Cream	Kerodex #51	6
First Aid Kit	Standard Kit	1
Protective Clothing	Rubberized suits	2
	Tyvek suits	3
	Pairs of PVC gloves	12

11.7 Evacuation Plan (40 CFR 264.52(f))

The Paradise evacuation plan for the land treatment facility is as follows:

- The Paradise Facility Operator will signal all personnel at the site in the event of an emergency that requires evacuation via three long blasts from his automobile horn.
- If the emergency signal is sounded, than all personnel will evacuate the land treatment area via the land treatment access road from the town of Paradise (Figure 11-1).
- The alternate evacuation route will be the access road which exits the site to the northwest toward the town of Plains (Figure 11-1).

It is not anticipated that any emergency release will occur from the land treatment facility that will necessitate evacuation of personnel due to the fact that the land treatment facility will not contain volatile, explosive or corrosive liquids or materials which could pose a catastrophic health and safety problem to site personnel.

11.8 Copies of Contingency Plan (40 CFR 264.53)

The Contingency Plan will be maintained by the organizations listed in Table 11-2. Copies of the letters sent to these organizations are included at the end of this chapter.

11.9 Amendment of Contingency Plan (40 CFR 264.54)

The Contingency Plan will be reviewed and amended, if necessary, whenever:

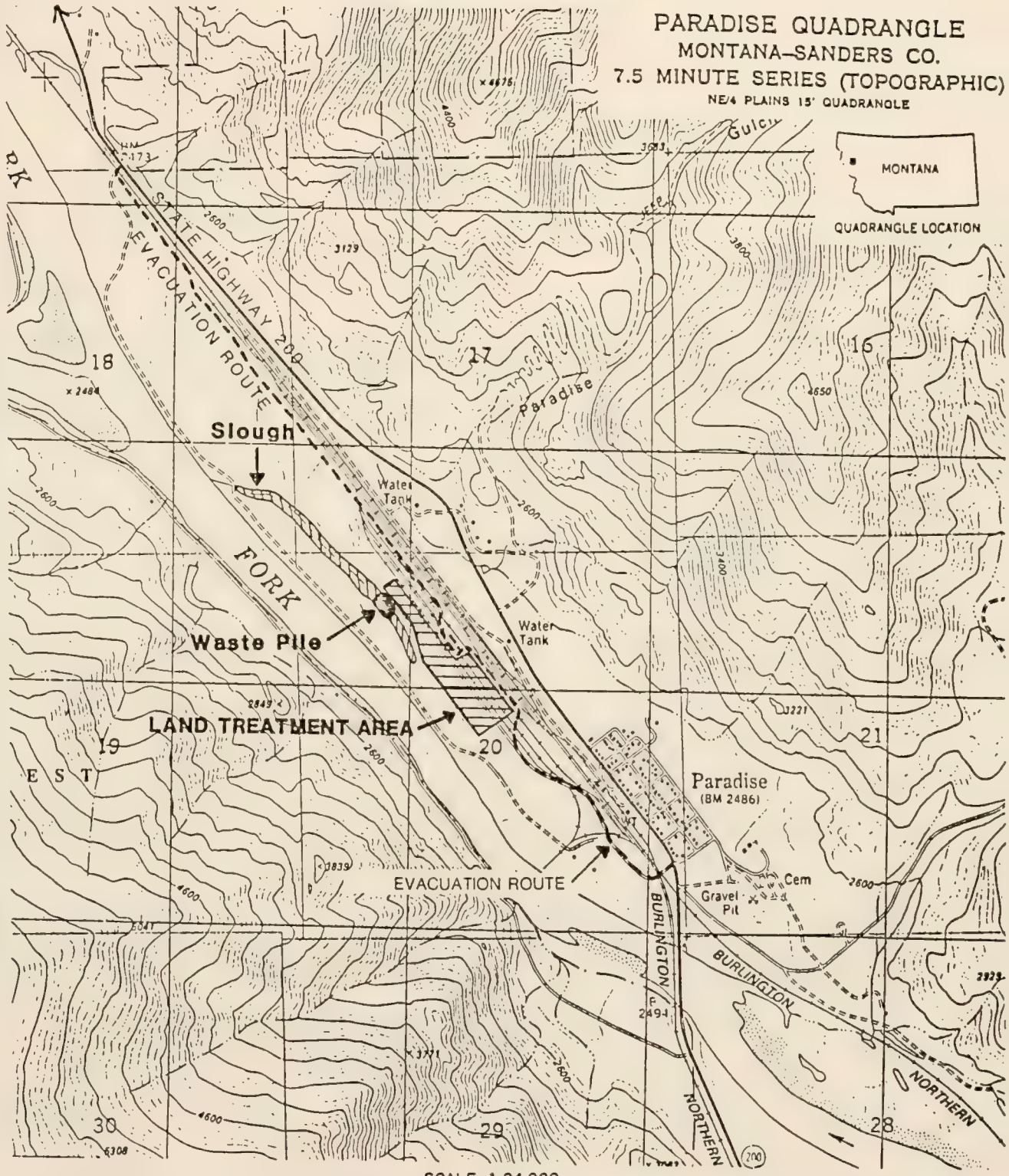
1) The facility permit is revised;

2) Deficiencies are noted during an emergency;

3) The facility design, construction, operation, maintenance, or other circumstances change in a way that increases the potential for fires, explosion or releases of hazardous waste or hazardous waste constituents, or changes the response necessary in an emergency;

4) The list of Emergency Coordinators changes; or

5) The list of emergency equipment changes.



EVACUATION ROUTES

FIGURE 11-1

June 17, 1987

Paradise Volunteer Fire Department
P.O. Box 172
Paradise, MT 59856

Gentlemen:

Burlington Northern Railroad is preparing to treat hazardous wastes in a land treatment facility located near the former Paradise Tie Treating Plant. Some of the material stored is considered a hazardous waste due to its nature and/or constituents. As you are probably aware, the handling of hazardous wastes is governed by regulations developed by the U.S. Environmental Protection Agency for the enforcement of the Resource Conservation and Recovery Act. As required by these regulations, specifically 40 CFR 264.53, Burlington Northern Railroad is submitting a copy of its contingency plan for emergencies at the Paradise Land Treatment Facility.

The purpose of this submission is to familiarize you with the land treatment area layout, properties of the wastes stored at the Paradise waste pile and the waste to be treated at the land treatment area, location of specific hazards, fire roads and routes, and mutual aid agreements, all of which are discussed in the contingency plan. Please note, the plan summarizes the hazardous wastes handled at the waste pile and land treatment area, their hazardous characteristics, potential reactions, preventative measures to be taken against the hazards, and corrective measures to be taken should a problem occur.

Should you have any questions or desire further information, please contact Bruce Sheppard at 206-467-3382 in Seattle, Washington. For your information, copies of the plan have been submitted to the following emergency departments and hospitals.

1) Plains Volunteer Fire Department
2) Sanders County Sheriff's Department
3) Clark Fork Valley Hospital

Sincerely,

Mel Burda
Environmental Engineer-Seattle Region

June 17, 1987

Plains Volunteer Fire Department
Plains, MT 59859

Gentlemen:

Burlington Northern Railroad is preparing to treat hazardous wastes in a land treatment facility located near the former Paradise Tie Treating Plant. Some of the material stored is considered a hazardous waste due to its nature and/or constituents. As you are probably aware, the handling of hazardous wastes is governed by regulations developed by the U.S. Environmental Protection Agency for the enforcement of the Resource Conservation and Recovery Act. As required by these regulations, specifically 40 CFR 264.53, Burlington Northern Railroad is submitting a copy of its contingency plan for emergencies at the Paradise Land Treatment Facility.

The purpose of this submission is to familiarize you with the land treatment area layout, properties of the wastes stored at the Paradise waste pile and the waste to be treated at the land treatment area, location of specific hazards, fire roads and routes, and mutual aid agreements, all of which are discussed in the contingency plan. Please note, the plan summarizes the hazardous wastes handled at the waste pile and land treatment area, their hazardous characteristics, potential reactions, preventative measures to be taken against the hazards, and corrective measures to be taken should a problem occur.

Should you have any questions or desire further information, please contact Bruce Sheppard at 206-467-3382 in Seattle, Washington. For your information, copies of the plan have been submitted to the following emergency departments and hospitals.

1) Paradise Volunteer Fire Department
2) Sanders County Sheriff's Department
3) Clark Fork Valley Hospital

Sincerely,

Mel Burda
Environmental Engineer - Seattle Region

June 17, 1987

Sanders County Sheriff's Department
Court House
Thompson Falls, MT 59873

Gentlemen:

Burlington Northern Railroad is preparing to treat hazardous wastes in a land treatment facility located near the former Paradise Tie Treating Plant. Some of the material stored is considered a hazardous waste due to its nature and/or constituents. As you are probably aware, the handling of hazardous wastes is governed by regulations developed by the U.S. Environmental Protection Agency for the enforcement of the Resource Conservation and Recovery Act. As required by these regulations, specifically 40 CFR 264.53, Burlington Northern Railroad is submitting a copy of its contingency plan for emergencies at the Paradise Land Treatment Facility.

The purpose of this submission is to familiarize you with the land treatment area layout, properties of the wastes stored at the Paradise waste pile and the waste to be treated at the land treatment area, location of specific hazards, fire roads and routes, and mutual aid agreements, all of which are discussed in the contingency plan. Please note, the plan summarizes the hazardous wastes handled at the waste pile and land treatment area, their hazardous characteristics, potential reactions, preventative measures to be taken against the hazards, and corrective measures to be taken should a problem occur.

Should you have any questions or desire further information, please contact Bruce Sheppard at 206-467-3382 in Seattle, Washington. For your information, copies of the plan have been submitted to the following emergency departments and hospitals.

1) Plains Volunteer Fire Department
2) Paradise Volunteer Fire Department
3) Clark Fork Valley Hospital

Sincerely,

Mel Burda
Environmental Engineer-Seattle Region

June 17, 1987

Clark Fork Valley Hospital
Plains, MT 59859

Gentlemen:

Burlington Northern Railroad is preparing to treat hazardous wastes in a land treatment facility located near the former Paradise Tie Treating Plant. Some of the material stored is considered a hazardous waste due to its nature and/or constituents. As you are probably aware, the handling of hazardous wastes is governed by regulations developed by the U.S. Environmental Protection Agency for the enforcement of the Resource Conservation and Recovery Act. As required by these regulations, specifically 40 CFR 264.53, Burlington Northern Railroad is submitting a copy of its contingency plan for emergencies at the Paradise Land Treatment Facility.

The purpose of this submission is to familiarize you with the land treatment area layout, properties of the wastes stored at the Paradise waste pile and the waste to be treated at the land treatment area, location of specific hazards, fire roads and routes, and mutual aid agreements, all of which are discussed in the contingency plan. Please note, the plan summarizes the hazardous wastes handled at the waste pile and land treatment area, their hazardous characteristics, potential reactions, preventative measures to be taken against the hazards, and corrective measures to be taken should a problem occur.

Should you have any questions or desire further information, please contact Bruce Sheppard at 206-467-3382 in Seattle, Washington. For your information, copies of the plan have been submitted to the following emergency departments.

1) Plains Volunteer Fire Department
2) Sanders County Sheriff's Department
3) Paradise Volunteer Fire Department

Sincerely,

Mel Burda
Environmental Engineer

MODULE III.LT

LAND TREATMENT UNIT

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MODULE III LT -- LAND TREATMENT UNIT

A. APPLICABILITY

The requirements of this Permit Module apply to the operation of the land treatment unit at the former BN Paradise tie plant. The Permittee must operate and maintain the land treatment unit in accordance with this Permit, applicable requirements in Title 16, Chapter 44, ARM, and as specified in the Application and addenda to the Application.

B. PERMITTED WASTES

1. General Requirements

a. all wastes placed on the land treatment unit are subject to the waste analysis requirements of Condition J.5. of this Module, and placement shall not exceed the capacity limit presented in Condition F.3. of this Module.

b. The Permittee shall not place on the land treatment unit hazardous liquid wastes, including free liquids associated with any solid waste or soil, containing metals at concentrations greater than those shown in Attachment III.LT.1. Attachment III.LT.1. is adapted from the Hazardous and Solid Waste Act California list criteria, RCRA Section 3004(d)(2)(B).

c. The Permittee shall not knowingly apply metal-bearing wastes in concentrations which would exceed the in-soil limits specified in Attachment III.LT.2.

d. The Permittee shall not apply wastes with a pH less than 5 or greater than 11.

e. The Permittee shall apply and treat only soil contaminated with hazardous waste listed as EPA Hazardous Waste Number K001, bottom sediment sludges from wood preserving processes that use creosote, that has resulted from cleanup and closure activities at the BN Paradise or Somers tie plants. Because the soil has been contaminated by a listed hazardous waste, it has become a hazardous waste through the mixture rule.

The Permittee shall also be allowed to store or land treat creosote-contaminated soils from Paradise or Somers that technically are not KOO1 wastes, such as drip track wastes, but are chemically identical. In the event that drip track or other creosote wastes become listed as hazardous, the Permittee shall be allowed to continue storage or land treatment of the waste in accordance with Permit requirements.

The original listed hazardous waste, K001, is not currently generated at Paradise or Somers and will not be placed on the land treatment unit. Both plants are now inactive. Up to 500,000 gallons of K001 were recovered at Paradise in 1984 and recycled at Somers in 1985 along with 100,000 gallons of K001 recovered from the Somers site. The remaining material is contaminated soil with varying degrees of contamination, that has been generated during RCRA cleanup and closure activities at Paradise, and CERCLA/RCRA remedial activities at Somers. The most heavily contaminated soils, which include about 3000 cubic yards removed from Somers under a cleanup order, average about 5% benzene extractables, whereas K001 sludges typically contain 25% total organics.

The term "soil and sludges" is used generally throughout the Application. In this sense, sludges are described as heavily contaminated soils resulting from cleanup and closure activities as opposed to wastewater treatment sludges. The distinction is important because of the difference in land application restrictions for the two wastes. EPA has granted a national capacity variance for soils contaminated with K001 until August 8, 1990.

2. Placement Priority

The highest priority shall be placed on treatment of soils from the Paradise waste pile. Thereafter, priority will be placed on treatment of additional soils from Paradise cleanup activities. Wastes from Somers will be accepted only if capacity is available and a permit modification is made. Any wastes transported from Somers to the Paradise land treatment unit shall be manifested and transported in accordance with hazardous waste regulations.

C. PERMITTED PROCESS UNIT

1. The Permittee is entitled to operate a land treatment program for the wastes specified in Condition B. of this Module, at the following designated area in Sanders County, Montana:

Unit Identification	Area	Location
B.N. Paradise Tie Treating Plant Land Treatment Unit	26 acres	NW quarter of Section 20 & SW quarter of Section 17, T.19N, R.25W

Attachment III.LT.3. shows the general location of the Paradise tie plant. Attachment III.LT.4. shows the location of the land treatment unit within the tie plant.

2. For the purposes of this Permit, the regulated unit consists of the land treatment unit, monitor wells and lysimeters, fencing, and associated run-on and run-off control structures.

D. PRINCIPAL HAZARDOUS CONSTITUENTS

The constituents listed in Attachment III.LT.5., referred to throughout this Module as the principal hazardous constituents or PHCs, shall be evaluated routinely in groundwater, soil-pore water, and land treatment unit soils. These constituents are found in significant quantities in the permitted wastes, and they provide a reliable indication of the presence of hazardous constituents in the environmental media listed above. In the event that PHCs are detected in environmental media below the treatment zone, the Permittee may be required to analyze for a more extensive list of constituents. See Conditions K.2. and K.4. of this Module, and Module IV.LT., Groundwater Monitoring.

E. HORIZONTAL AND VERTICAL DIMENSIONS OF THE TREATMENT ZONE

1. The treatment zone is the portion of the unsaturated zone below and including the land surface in which the conditions necessary for effective degradation, transformation, or immobilization are maintained. The horizontal dimensions of the treatment zone are the areas within the application area dikes shown in Attachment III.LT.10.

2. Wastes shall be applied only in a defined portion of the treatment zone, called the zone of incorporation (ZOI). The

ZOI consists of a soil layer from the ground surface to a point 12 inches below the surface within the treatment zone.

3. The total depth of treatment zone in the application areas shall in no event exceed 5 feet. The maximum depth of the treatment zone must at all times be a minimum of 3 feet above the seasonal high water table.

F. OPERATION OF THE LAND TREATMENT SYSTEM

1. General Requirements

a. The Permittee shall operate and maintain the land treatment unit to maximize the degradation, transformation, and immobilization of hazardous constituents in the treatment zone. The unit must be operated in accordance with the methods described in the Application and the Conditions contained in this Module.

b. The Permittee shall utilize a series of records identified in Condition M. of this Module to evaluate the operation of the land treatment area. Records shall be kept for all of the following: rate and method of waste application, testing and application to control pH, testing and application for nutrient addition, tillage, control of moisture and wind dispersal, inspections, and routine monitoring.

2. Method of Waste Application

a. Wastes are applied to the land application area when soils are workable with agricultural equipment, generally from May through November, weather and road conditions allowing.

b. For the purposes of waste application, the land treatment area shall be divided into 100 foot by 100 foot plots. Wastes are to be applied using dump trucks, placing loads approximately in the center of each plot. Initially, up to four truck loads will be applied to each plot prior to spreading.

c. A bulldozer or scraper is used to spread the wastes, for an initial waste depth of about 2 inches.

d. Composite samples are to be collected from the ZOI in every other plot and analyzed daily. See Condition J.7.of this Module, ZOI Soil Core Monitoring. The objective of the daily sampling is to assure consistent waste application, and conformance with the limits on rate of waste application outlined in Condition F.3. of this Module.

e. If composite sampling described in Condition F.2.d. of this Module indicates that the waste application limit has not been reached, then additional wastes can be added. However, under no circumstances shall the application limit of 5% benzene extractables outlined in Condition F.3. of this Module be exceeded.

f. As waste application is initiated, the Permittee shall observe the ZOI soils closely, to check for nonuniform incorporation of wastes into the soils. If creosote "tar balls" begin to form, waste application procedures shall be immediately modified, so that more uniform application can be achieved. Additional mixing with waste pile soils, grinding, or screening techniques shall be considered for improving the uniformity of waste application.

g. Wastes shall be incorporated into SOI soils through tillage as soon as possible after application, in order to minimize nuisance odors.

3. Rate of Waste Application

a. Benzene extractables, as determined by SW-846, Third Edition, Method 9071, except that benzene is substituted for freon as an extracting agent, will define limiting conditions for application of hazardous wastes. The rate limit is two-fold, with a limit for mass of benzene extractables applied per unit area during the operating life of the land treatment facility, and a limit for weight percent benzene extractables found in the ZOI at any point in time. Neither requirement of the rate limit can be exceeded. The limits are:

- 5 percent benzene extractables (dry weight), in soil samples taken from the 12 inch ZOI; and,

- 80 tons benzene extractables/acre, not to be exceeded in any application uniform area, over the operating life of the facility. A uniform area, for the purposes of this permit, is a portion of the active land treatment unit, up to four acres in size, which has the same soil type. Uniform areas are referred to as cells in the permit application. A uniform area is considered as a single monitoring area. Refer to Condition J.3.a. of this Module.

As the table in Attachment III.LT.6. illustrates, the rate limit (tons/acre) for benzene extractables is based on the initial concentration in ZOI soils in the land

treatment demonstration field study performed by the Permittee. The study demonstrated that when K001 wastes were applied at this rate, hazardous constituents were degraded or immobilized, and did not migrate out of the treatment zone.

b. The dry weight percent of benzene extractables in the ZOI shall be determined through daily monitoring of every other plot of the treatment zone, as described in F.2.d.

c. The Permittee shall demonstrate annually, beginning with the calendar year 1989, compliance with the 80 tons/acre rate limit established in F.3.a. of this Module. The demonstration shall be made for each uniform area, by tabulating:

- the mass of wastes applied to each uniform area based on operating records;

- the weight percent of benzene extractables for applied wastes, based on operating records;

- the mass of benzene extractables applied during the reference period;

- the total mass of benzene extractables applied to each uniform area divided by the acreage of each uniform area, to demonstrate compliance with the rate limit.

d. The Permittee shall demonstrate on an annual basis, beginning with the wastes applied in calendar year 1989, and at closure, that the metals criteria shown in Attachment III.LT.2. are not being exceeded in the 12 inch ZOI. Sampling and analysis shall be conducted in

accordance with Condition J.7.b.iii. of this Module. If the criteria in Attachment III.LT.2. are exceeded, the Permittee may only place wastes on the areas for which the metals concentrations are less than or equal to the in-soil limits.

e. For the purposes of demonstrating that a life of facility loading rate greater than 80 tons/acre may be acceptable, the Permittee is allowed to make the following demonstration:

i. The Permittee is allowed to set up a demonstration plot within the permitted land treatment area, not to exceed 50 feet by 50 feet in size, or in the LTD demonstration plots.

ii. Although the 5% benzene extractable loading in this plot cannot be exceeded at any point in time, wastes can be experimentally applied at rates exceeding 80 tons/acre, for the 1989 application season.

iii. Based on the results of degradation and constituent migration evaluations for the demonstration plot, the Department may determine, for subsequent application seasons, that the land treatment unit can be loaded at a rate greater than 80 tons/acre.

iv. If such a demonstration is to be conducted, the Permittee shall submit a plan to the Department for approval by July 5, 1989, outlining where the experimental plot will be located, how it will be operated, and how it will be monitored.

4. Measures to Control Soil pH

a. Hazardous wastes shall be measured for pH at the frequency described in Condition J.5.b.ii. of this Module. In no event shall a waste be applied which has a pH of less than 5 or greater than 11.

b. The Permittee shall measure soil pH in the 12 inch ZOI annually, in the fall, as described in Condition J.7.b.iii. of this Module. A measurement shall be taken from three composite samples from each uniform area.

c. The soil pH of the land treatment area ranges from slightly acidic to neutral. The target pH after waste application is 5.5 to 9.0. Should soil monitoring indicate that soil pH has dropped below 5.5, the uniform areas with low pH shall be limed with agricultural grade limestone at a rate of two tons per acre.

d. In the event that soil pH exceeds 9.0, the Permittee shall submit to the Department for approval a plan to reduce the soil pH to established target levels.

5. Nutrient Addition

a. The Permittee shall apply readily available nitrogen to the land treatment unit on an annual basis. An equivalent of 100 pounds of nitrogen per acre shall be applied annually to maintain a high fertility status. Nitrogen shall be added as an ammonium fertilizer, to limit losses due to nitrate leaching. As conditions dictate, the Permittee is also allowed to apply manure as a soil amendment and source of available nitrogen and phosphorous.

b. The Permittee shall collect ZOI samples annually in the fall, as described in Condition J.7.b.iii. of this Module, in order to document that the nutrient requirements of the of the land treatment unit are being met. The soil shall be analyzed in accordance with procedures listed in Attachment III.LT.12., Test Methods. At a minimum, nutrients shall be maintained at the following levels:

50 ppm N
20 ppm P

6. Tillage

a. The Permittee shall utilize tillage of the ZOI to enhance microbial degradation of the applied wastes.

b. Weather and road conditions permitting, all active portions of the land treatment area shall be tilled every two weeks, from May through November, except when Condition F.6.c. applies. These are the months when the land treatment unit is most accessible, and waste is being applied. During the winter months, frozen conditions prevent efficient tillage.

c. The Permittee shall perform tillage at those times which can minimize wind dispersal. The Permittee shall ensure that tillage does not result in unnecessary pulverization of the soil surface, resulting in airborne dispersal of wastes and soils, during dry periods and under excessively windy conditions.

7. Measures to Control Soil Moisture in the Treatment Zone

a. Moisture content in the treatment zone shall be managed by the Permittee, in order to maximize waste degradation, while minimizing unnecessary blowing of wastes and soils.

b. Soil moisture shall be supplied through a sprinkler irrigation system. The system will consist of a series of movable laterals spaced on 60 foot centers with low angle sprinkler heads capable of delivering 0.2-.3 inches per hour. Sufficient laterals will be available to irrigate up to 6 acres per day. The existing well PW-1 will be used as a supply of irrigation water. Down hole submersible pumps will lift the water to a mainline distribution system.

c. The irrigation system shall be capable of delivering 200 gpm and covering 25% of the active area at any one time. The system shall be capable of irrigating the entire land treatment unit in a week.

d. The Permittee's site operator will determine the water requirements based on weekly measurements of the soil moisture present in the ZOI using a hand tensiometer. The operator will note the tensiometer readings in the facility log book as well as daily measurements of rainfall and pan evaporation. The target moisture level is 0.3 bars. No more than one inch of water per week shall be applied to any uniform area, and the total monthly amounts should not exceed the net evaporative losses (precipitation - pan evaporation).

8. Control of Wind Dispersal

The Permittee shall ensure that airborne dispersal of wastes and surface soils will be kept to a minimum. Tillage shall be avoided during excessively dry or windy periods. The Permittee shall note in the operating log any incidents of blowing soils or wastes, and document efforts made to control wind dispersal.

G. RUN-ON AND RUN-OFF CONTROL SYSTEMS

1. The Permittee shall operate and maintain control structures, such as dikes and drainage swales, for the land treatment unit that will:

   a. Prevent run-on flow onto the treatment zone during peak discharge from a 24-hour, 25-year storm;

   b. Collect and control run-off resulting from at least the water volume resulting from a 24-hour, 25-year storm.

2. The control structures shall be inspected weekly and after storms, and must be maintained for the life of the unit, including the closure period.

3. The Permittee shall perform repairs or maintenance as necessary to ensure that proper performance of the control structures is maintained. Repairs are to be made within one week of the time damage is noted.

4. In order to demonstrate compliance with this Condition, the Permittee shall provide to the Department no later than July 5, 1989, a facility map showing all run-on and run-off control structures associated with the land treatment unit, and calculations which demonstrate that the structures will

protect the land treatment unit during a 24-hour, 25-year storm event.

H. INSPECTION OF LAND TREATMENT FACILITIES

1. The Permittee shall follow the schedule of inspection for the land treatment unit as established in the Application and as shown in Attachment III.LT.7.

2. The inspection checklist shown in Attachment III.LT.8. shall be followed. Fencing, dikes, warning signs, road conditions, and monitor wells shall be included in the inspection.

3. Unusual conditions such as ponded water or wind blown soils, if present, shall be noted in the operating log.

4. All inspection activities shall be noted and made part of the operating record.

I. FOOD CHAIN CROPS

1. No crops or commercial forage shall be grown on land at this facility used for the treatment of hazardous wastes.

2. The notation on the deed for the surface impoundment closure required under 40 CFR 265.116, incorporated by reference in ARM 16.44.609, shall be amended for land treatment to state:

   a. Creosote wastes containing organic hazardous constituents and heavy metals, have been placed on the land treatment unit;

   b. Food-chain crops must not be grown on those areas except in compliance with 40 CFR 264.276, as incorporated by reference in ARM 16.44.702.

A copy of the amended notation shall be provided to the Department by July 5, 1989.

J. LAND TREATMENT MONITORING REQUIREMENTS

1. General Requirements

a. The Permittee shall follow a regular schedule of monitoring as shown in Attachment III.LT.9., and as described in Module IV.LT., for applied wastes, soils, soil pore water, and groundwater.

b. The Permittee shall follow the evaluation requirements established in Condition K. of this Module.

c. All monitoring involving collection and analysis of samples shall follow the methods and procedures established in Conditions J.2., J.3., and J.4., and Module IV.LT., including the criteria established for quality assurance and quality control measures.

d. Results of all land treatment monitoring activities shall be noted and maintained in the operating record.

2. General Sampling Methods

a. All samples are to be collected in accordance with methods outlined in Test Methods for Evaluating Solid Wastes, Physical Chemical Methods, EPA 1986 (SW-846), or as otherwise specified in this Permit.

b. All samples shall be iced or preserved as specific analytical methods dictate, at the time of collection and during transport to the laboratory. A chain of custody

from the field to the laboratory must be maintained and documented.

c. All sampling equipment must be precleaned, then decontaminated between samples as required.

d. Records of all sampling methods and events shall be incorporated into the operating record.

3. Selection of Random Sampling Sites

Where random soil samples or lysimeter sites are required, the sample sites will be selected as follows:

a. The land treatment unit shall be divided into uniform areas, not to exceed four acres, under the direction of a certified professional soil scientist. A uniform area is defined as an area of the active portion of a land treatment unit which is composed of the same soil, and to which similar wastes will be applied at similar rates. Uniform areas of the land treatment unit are used as a single monitoring unit, and soil core sampling locations or lysimeters are then located randomly within a given uniform area. The uniform areas shall be permanently established prior to background sampling. See Attachment III.LT.10. for a map showing the uniform areas, called cells in the attachment, within the land treatment unit.

b. The Permittee shall choose soil sampling points or lysimeter locations within each uniform area as described in Attachment III.LT.11. When selecting sampling sites, any point that falls within twenty feet of the uniform area boundary shall be discarded to avoid edge effects, and another random point shall be selected.

c. The procedure for random selection of sampling sites within uniform areas must be performed for each soil core sampling event but only once for the location of the lysimeter sites.

4. General Analytical Methods

a. Attachment III.LT.12. lists all applicable test methods to be used in the land treatment monitoring program.

b. Analytical reports shall contain the following information:

i. Analytical methods used, including method number references;

ii. Practical quantitation limits (PQLs) for every parameter tested;

iii. Quality control information pertinent to analysis involved (spikes, duplicates, blanks, etc.), including acceptance limits for spikes;

iv. Laboratory used;

v. Data sheets provided by the laboratory;

vi. Method detection limits for every parameter tested;

vii. Low level soil-pore and groundwater data shall be reported as follows:

Analyte Concentration	Report
<MDL	Not detected (Give MDL value)
≥MDL but <PQL	Found but not quatitated
≥PQL	Numerical value reported

viii. PQLs for volatile organic compounds in soils by SW-846, Method 8020 may be no more than ten times the Method Detection Limit given in Table 1 of the method.

ix. For soil pore volatile and semi-volatile organic compounds, PQLs shall not exceed those given in Methods 8020 for groundwater and Method 8270 for groundwater respectively. Report results in the format given in Condition III.LT.J.4.b.vii.

x. For ZOI soils during the active life of the land treatment unit and for the first two years of closure, PQLs for semi-volatiles in soil by SW-846 method 8270 may be no more than those given in the method for medium-level soil and sludges by sonicator in Table 2 of the proposed revisions to SW-846. (The current edition of SW-846 gives an incorrect formula for calculation of PQLs for other matrices.)

xi. For treatment zone soils, below treatment zone soils, and ZOI soils after the first two years of closure or when determining whether the closure performance standard has been met, PQLs for low soil/sediments matrices as listed in Table 2 of the method must be used.

xii. For all mass spectroscopy analyses, positive identification and quantitation is required for the compounds listed in the method. Tentative identification and estimated concentrations must be reported for all other compounds observed in the extract.

c. Refer to Attachments III.LT.13., III.LT.14., and III.LT.15. for specific reporting requirements for analysis by HPLC, GC/MS, and GC/PID. After permit issuance, the results of the first sampling event shall be accompanied by the completed forms for all of the samples. Following the initial sampling, completed forms from these attachments shall be required for 10% of samples. Should the Permittee change laboratories, completed forms will be required for all samples on the first sampling round and 10% of samples afterwards.

d. The Permittee shall ensure that all laboratory analyses undertaken as part of this Permit contain adequate quality control and quality assurance. The laboratory must be capable of evaluating quality control procedures as specified in SW-846. The laboratory must also have quality control and backup information available for specific analyses, which must be submitted to the Department with sample analytical results as described in Attachments III.LT.13., III.LT.14., and III.LT.15.

e. The Permittee shall ensure that the PQLs that are specified for given analytical methods, constituents, and media in SW-846 are routinely achieved in all analyses.

f. Analytical results shall be incorporated into the operating record.

g. The Permittee shall submit to the Department, the Quality Assurance Plan and the name of a contact person for each analytical laboratory which they use.

5. Waste Monitoring

Waste monitoring shall be done generally in accordance with Attachment III.LT.16., which is the waste analysis plan (Chapter 7) from the Application. The main items of that plan are summarized in the Conditions below. Condition J.5.b.ii., requiring additional analyses of wastes, is an exception. This Condition is an additional requirement, not found in the waste analysis plan.

a. Number of Samples and Sampling Frequency

Two composite waste samples shall be collected twice daily during waste application periods.

b. Analytical Parameters

i. Two waste samples shall be analyzed in an on-site laboratory for benzene extractables. PAH analysis shall be performed on one sample per day by an off-site laboratory. Analytical methods shown in Attachment III.LT.12. shall be used.

ii. At the beginning and end of each application period, or at a minimum four times during the active operation of the land treatment unit, additional analyses shall be performed on a composite waste sample. An off-site laboratory shall analyze for organic volatiles, pH, and the "California list" metals shown in Attachment III.LT.1., to ascertain the continued suitability of those wastes for land treatment. Analytical methods shown in Attachment III.LT.12. shall be used.

c. Sample Types and Collection Methods

Grab samples shall be collected from the waste pile or transporting truck, using a stainless steel trowel. Three to five grab samples shall be composited in a stainless steel bucket, then transferred to a one-quart glass jar. Samples shall be properly labeled, iced, and transported to the laboratory for analysis.

6. Soil Pore Liquid Monitoring

Soil-pore liquid monitoring shall be done generally in accordance with Attachment III.LT.17., which is the soil pore monitoring plan taken from the Application. The following Conditions outline the requirements, with exceptions or additions to the plan noted.

a. Number of Samples and Sampling Frequency

Soil-pore liquid sampling shall follow the procedures described in Attachment III.LT.17., with the following exceptions:

i. Background will be established by installing one lysimeter for each soil series present in the land treatment unit, or a minimum of three lysimeters.

ii. A tensiometer will be paired at the same depth with each lysimeter.

iii. Following each application of waste, soil-pore liquid will be sampled a minimum of three times in the following 90 days. The Permittee may choose the time of sampling based on tensiometer readings or precipitation events. If conditions in those 90 days

do not allow for the collection of three soil-pore liquid samples, then the Permittee must continue attempting to sample whenever conditions are appropriate, until three samples have been collected following waste application.

b. Analytical Parameters

i. Soil-pore liquid samples shall be analyzed for the principal hazardous constituents listed in Attachment III.LT.5., using the methods given in Attachment III.LT.12., doing PAHs by Method 8270 (GC/MS) for the base neutral fraction only.

ii. Because sample volumes from lysimeters may be smaller than recommended in SW-846, the Permittee may submit smaller volumes for analysis, recognizing that PQLs for these samples will be higher than prescribed by the method. Analytical reports to the Department of such results should clearly indicate any required changes for PQLs.

c. Sample Types and Collection Methods

i. As outlined in Attachment III.LT.17., p.37-7, pressure-vacuum lysimeters shall be installed at randomly selected locations throughout the land treatment unit uniform areas, at an approximate below treatment zone depth of 5.5 feet.

ii. Selection of random sampling sites shall be done in accordance with Condition J.3. of this Module.

iii. As described in Attachment III.LT.17., soil-pore liquid samples will not be composited, but will be analyzed individually for each lysimeter.

iv. Each time a sample is collected from a lysimeter, its volume shall be measured and recorded. If a lysimeter is checked and the Permittee determines that there is insufficient volume for analysis, the volume must still be measured and noted. This requirement is in addition to steps outlined in Attachment III.LT.17.

7. Zone of Incorporation (ZOI) Soil Monitoring

ZOI monitoring shall generally be done in accordance with Attachment III.LT.11., which is the soil core monitoring section of the Application. Any exceptions or additions to that plan are described in the Conditions below.

a. Number of Samples and Sampling Frequency

i. Prior to any waste application, a one-time event of eight randomly collected soil cores shall be collected, to represent background soil quality. These cores shall not be composited, but analyzed individually at the ZOI (0-12 inches) interval.

ii. During waste application periods, every other 100 foot by 100 plot grid shall be sampled and analyzed for benzene extractables on a daily basis. Samples shall be taken after wastes are applied, spread, and incorporated into the soil. A minimum of three grab subsamples shall be composited, so that a single composite sample can be analyzed for the individual plots. An average of six composite samples shall be

analyzed in each uniform area during the waste application period.

iii. Once waste application begins, semiannually in the spring and the fall, nine ZOI soil subsamples shall be collected from each four acre uniform area. The subsamples shall be taken from the 0"-12" depth. Subsamples 1, 2, and 3 are to be composited; subsamples 4, 5, and 6 are to be composited; and subsamples 7, 8, and 9 are to be composited. The result will be three composited samples from each uniform area of the ZOI.

b. Analytical Parameters

i. ZOI samples collected daily during waste application periods shall be analyzed for benzene extractables only.

ii. Background ZOI samples and ZOI samples collected semiannually shall be analyzed for the principal hazardous constituents (PHCs) shown in Attachment III.LT.5. and for Microtox analyses. The background and the first semiannual ZOI samples following waste application shall also be analyzed for acid extractable and semi-volatile organic compounds.

iii. Annually, in the fall, the ZOI samples shall also be analyzed for pH, nutrients (N and P), and the list of metals shown in Attachment III.LT.2.

iv. The analytical methods shown in Attachment III.LT.12. shall be used.

c. Sample Types and Collection Methods

i. Selection of random sampling sites shall be done in accordance with Condition J.3. of this Module.

ii. Core samples shall be collected with a truck mounted hollow stem auger and split spoon sampler, as described on p.37-6 of Attachment III.LT.11. Alternatively, the Permittee is allowed to collect ZOI subsamples with a trowel, spade, or other hand sampling device.

iii. The Permittee shall keep accurate records of where the ZOI subsamples are taken.

iv. In the event that waste application leads to the formation of creosote "tar balls," such as were observed during the land treatment demonstration, the Department shall be notified, and sampling methods shall be re-evaluated. The Permittee shall submit a plan for revised sample preparation methods to the Department for approval, which could include grinding, blending, and compositing. The purpose of the additional sample preparation steps would be to produce samples that are representative of actual field conditions.

8. Treatment Zone (TZ) and Below Treatment Zone (BTZ) Soil Core Monitoring

a. Number of Samples and Sampling Frequency

i. Simultaneously with the collection of eight randomly collected ZOI background cores described in Condition

ii. Core samples shall be collected with a truck mounted hollow stem auger and split spoon sampler as described on p.37-6 of Attachment III.LT.11.

iii. The two TZ and BTZ samples collected semiannually from each uniform area shall not be composited, but analyzed individually.

iv. The Permittee shall keep accurate records of where TZ and BTZ cores are taken.

v. The Permittee shall take precautions, when collecting TZ and BTZ soil samples, to minimize the potential for contamination of samples by overlying surface soils. A suggested technique for minimizing lower zone contamination is illustrated in Attachment III.LT.18.

9. Groundwater Monitoring

Groundwater monitoring is to be conducted in accordance with the methods outlined in Module IV.LT.

10. Air Quality Monitoring

The Permittee must design and install a PM10 monitoring system for the land treatment unit. PM10 filters will be analyzed routinely for total suspended solids and on a regular basis for polynuclear aromatic hydrocarbons. The Permittee must also collect and maintain a continuous record of wind speed and direction. The Permittee shall submit an air quality monitoring plan to the Department for approval, prior to application of any wastes.

K. MONITORING EVALUATIONS

1. Waste Analysis Evaluation

a. Refer to Conditions F.3.c. of this Module. Waste analytical results for benzene extractables shall be evaluated annually, in order to verify that the waste application limit is not being exceeded.

b. Refer to Conditions B.1.b. and B.1.d. of this Module. If at any time analyses indicate that there are metals concentrations exceeding the levels shown in Attachment III.LT.1., or wastes with a pH value outside of the range pH 5-11, the Department shall be immediately notified. Consultation shall immediately begin to determine the suitability of the wastes for continued land application.

2. Soil-Pore Liquid Monitoring Evaluation

a. For the organic constituents listed in Attachment III.LT.5, the following evaluation method is outlined:

i. If one or more organic constituent from Attachment III.LT.5 is detected in any lysimeter, at a value equal to or greater than the PQLs listed in Condition J.4.b.ix. for that method, then the Department must be notified within fifteen days of receipt of the analytical information by the Permittee. Within thirty days of receiving the analytical information, the Permittee must re-sample the lysimeter.

ii. Re-sampling is necessary only at the lysimeter or lysimeters that show concentrations equal to or greater than PQLs and only for those constituents detected.

iii. If a lysimeter sample cannot be collected within thirty days of receipt of the initial analyses by the Permittee, because of dry conditions, then the lysimeter shall be checked weekly until a sample is available.

iv. During this period, the Permittee may investigate the possibility that a source other than the land treatment unit is causing the appearance of the hazardous constituents, or that the results represent an error in sampling, analysis, or evaluation.

v. If the repeat sampling indicates detection of at least one constituent, it is considered a statistically significant increase. The Department shall be notified within seven days of receipt of the analytical results by the Permittee.

vi. If it has been determined that there has been a statistically significant increase as indicated in Condition K.2.a.v. of this Module, another sample shall be taken immediately at the same lysimeter or lysimeters and analyzed for semi-volatile organics by Method 8270 and for volatile organics by Method 8240. The Department shall be notified of the results within seven days of receipt of the analytical results by the Permittee.

vii. If it is determined that there has been a statistically significant increase as indicated in Condition K.2.a.v. of this Module, the Permittee shall submit an application for a Permit modification. The modification shall describe changes to the operating

practices at the land treatment unit that will maximize the success of degradation, transformation, or immobilization processes in the treatment zone. The application shall be submitted to the Department within 90 days of receipt of the analytical results in K.2.a.v. by the Permittee.

b. If organic hazardous constituents appear in both background and land treatment unit lysimeters during the same sampling event, a statistical procedure as described under 40 CFR 264.280(d)(3), as incorporated by reference in ARM 16.44.702, shall be used to determine statistical significance. Statistically significant concentrations will require the notification and response procedures outlined in K.2.a.vi. and K.2.a.vii. above.

c. Lead and arsenic concentrations in land treatment unit lysimeter samples will be evaluated by comparison to background concentrations, using a statistical procedure as described under 40 CFR 264.280(d)(3), as incorporated by reference in ARM 16.44.702. Statistically significant concentrations will require the notification and response procedures outlined in K.2.a.v. and K.2.a.vi. above.

3. Zone of Incorporation Soil Monitoring Evaluation

a. The Permittee intends to use a statistical approach to compare analytical results for benzene extractables, PHCs, pH, and nutrients to operational and closure criteria that are established in this Module. In order to use a statistical approach, rather than comparison of individual analytical results to the criteria, a satisfactory statistical approach must first be submitted to the Department for approval. The Permittee shall submit to

the Department by July 5, 1989, a written description of the specific statistical tests and assumptions that will be used. The Department will determine whether the proposed statistical approach is satisfactory within 30 days.

b. See Conditions F.2.d., F.2.e., and F.3.a. of this Module. Benzene extractable analytical results shall be evaluated daily during the waste application process, in accordance with the statistical methods established in Condition K.3.a. above, to verify that the 5% dry weight basis application limit is not being exceeded.

c. See Condition J.7.b.iii. of this Module. Results of pH and nutrient analyses area shall be evaluated annually to document that the liming and fertilizer requirements of each uniform area, as described in Conditions F.4. and F.5. of this Module, are being met. Statistical methods established through Condition K.2.a. shall be used.

d. See Condition J.7.b.iii. of this Module. Results of the metals analyses will be evaluated annually to verify that the metals criteria shown in Attachment III.LT.2. are not being exceeded.

4. Treatment Zone and Below Treatment Zone Soil Monitoring Evaluation

a. See Condition J.8. of this Module. Although both treatment zone and below treatment zone soils are to be analyzed routinely for PHCs, in order to monitor for migration of constituents within and out of the treatment zone, only BTZ soils need to be evaluated as described in this Condition. For the organic constituents listed in

Attachment III.LT.5., the following evaluation method is outlined:

i. If one or more organic constituent is found in any BTZ soil core, the Department must be notified within fifteen days of receipt of the analytical information by the Permittee. Another core must be taken within ten feet from the location where the first core was sampled, within thirty days of the Permittee receiving the analytical information.

ii. Re-sampling is necessary only for the core or cores that show concentrations above detection and only for those constituents detected.

iii. During this period, the Permittee may investigate the possibility that a source other than the land treatment unit is causing the appearance of the hazardous constituents, or that the results represent an error in sampling, analysis, or evaluation.

iv. If repeat sampling indicates appearance of at least one constituent, it is considered a statistically significant increase. The Department shall be notified within seven days of receipt of the analytical results by the Permittee.

v. If it is determined that there has been a statistically significant increase as indicated in Condition K.4.iv. of this Module, another sample shall be taken immediately, near the original cores, for volatile organics by Method 8240 and for semi-volatile organics by method 8240 in the ZOI, within the

treatment zone, and below the treatment zone. The Department shall be notified of the results within seven days of receipt of analytical results by the Permittee.

vi. If it is determined that there has been a statistically significant increase as indicated in Condition K.4.iv. of this Module, the Permittee shall submit an application for a permit modification. The modification shall describe changes in operating practices at the land treatment unit that will maximize the success of degradation, transformation or immobilization processes in the treatment zone.

b. Lead and arsenic concentrations in land treatment unit BTZ soil samples will be evaluated by comparison to BTZ concentrations found in the eight background BTZ samples described in Condition J.8.a.i. of this Module. The Permittee will use a statistical procedure as described under 40 CFR 264.280(d)(3), as incorporated by reference in ARM 16.44.702. The recommended statistical method is the Student T difference of means, using the pooled variance approach. A discussion of this approach, excerpted from EPA's Permit Guidance Manual on Unsaturated Zone Monitoring for Hazardous Waste Land Treatment (1986) is included as Attachment III.19. The selected statistical approach shall be run at a .01 level of confidence for individual one-tailed tests. Statistically significant concentrations will require the notification and response procedures outlined in K.4.iv., K.4.v., and K.4.vi. above.

5. Groundwater Monitoring Evaluation

Groundwater monitoring evaluation for the land treatment unit will be conducted according to the information presented in Module IV.LT., Groundwater Monitoring.

L. REPORTING REQUIREMENTS

1. Annually, by April 1, the Permittee shall submit to the Department a brief report for the previous calendar year which documents that the rate limit established for benzene extractables under Condition F.3. of this Module has not been exceeded. The report shall summarize both the results of the ZOI sampling for benzene extractables, discussed in Condition F.3.b., and the analysis of tons/acre benzene extractables applied as outlined in F.3.c.

2. Annually, by April 1, the Permittee shall submit to the Department a brief report that documents compliance with the metals loading criteria, outlined in F.3.d., during the previous calendar year.

3. Annually, by April 1, the Permittee shall submit to the Department laboratory reports of ZOI treatment zone and below treatment zone soil core monitoring, and soil pore liquid monitoring, outlined in Conditions J.6., J.7., and J.8. of this Module, for the previous calendar year. If organic hazardous constituents are detected in lysimeter samples or BTZ soil cores, then additional notification and evaluation procedures will be required, as outlined in Conditions K.2. and K.4. of this Module.

4. Reporting requirements for groundwater monitoring are described in Module IV.LT., Groundwater Monitoring.

M. RECORDKEEPING

1. The Permittee shall keep written records of the following land treatment unit activities:

Category	Records to be Kept
Waste Applications	- Sources of wastes applied - Waste volumes - Application dates - Areas to which wastes are applied - Waste sampling and analytical records - Evaluations/calculations of waste application rates and loading
Land Treatment Unit Operations	- Tillage dates, areas - Nutrient and pH control application dates and amounts - Any activities taken to control wind dispersal or ponding on land treatment units - Records of all routine inspections - Monitoring records including sampling logs or notes, analytical results, evaluations, and required reports for wastes, ZOI and TZ/BTZ soils, lysimeter samples, and groundwater samples
Other Documents	- Valid permit - Closure plan and closure cost estimates (as updated or revised)

- Copies of requests for permit modifications or changes in practices or procedures

2. All records required under this Condition must be furnished upon request, and made available at all reasonable times for inspection, by any duly designated representative of the Department.

N. CLOSURE/POST-CLOSURE REQUIREMENTS

The Permittee shall proceed with closure and post-closure generally in accordance with the plan shown in Attachment III.LT.21. Certain exceptions/additions are noted in the Conditions below. The Permittee may propose modification of either option of the current closure plan in writing to the Department at any time prior to within two months of notification of closure. The Department may require modifications to the existing or modified closure plan, and shall notify the Permittee in writing. Such a modification would constitute a modification to this permit.

In order to assure closure of the land treatment unit in a manner that minimizes or eliminates post-closure escape of hazardous constituents into the environment, two closure performance standard options have been established. At any point during the closure period, the Permittee can choose to satisfy either Option A or Option B closure. The closure performance standards are based upon a value known as the TOTAL PAH. The "total PAH" is the sum of the sixteen individual PAH compounds listed in Attachment III.LT.20.

1. Option A Closure Performance Standards

a. In order to complete closure under Option A, the Permittee shall continue normal operating procedures as described in Conditions N.3.a. through N.3.h. of this Module until the standards described in N.1.b. are met.

b. The closure performance standards under Option A are:

i. Total PAH in the ZOI for any uniform area is less than or equal to 10 µg/l, based on analysis of three composite samples collected as described in Condition III.LT.J.7.a.iii., and evaluated using statistical methods established through Condition III.LT.K.3.a. In determining the remaining PAH concentrations in the soil, values below the PQLs as defined in Condition III.LT.J.4.b.xi. will not be added to the total PAH value. No more than 5 µg/g of the total PAH can be carcinogenic PAH (see Attachment III.LT.20); and

ii. ZOI soils for any uniform area are non-toxic, as determined through the Microtox test or an equivalent bioassay. The Microtox test is described in Attachment III.LT.20. All three composite samples for each uniform area, collected as described in Condition III.LT.J.7.a.iii., shall be nontoxic. If Microtox is used, "nontoxic" shall mean a 15-minute EC50 greater than 100. If a different bioassay is used, the Permittee shall first submit to the Department for approval a description of the test, and supporting information for a "nontoxic" determination.

2. Option B Closure Performance Standards

a. In order to complete closure under Option B, the Permittee shall continue normal operating procedures as described in Conditions N.3.a. through N.3.h. of this Module for a minimum of five years after the last waste application.

b. The closure performance standards under Option B are:

i. Total PAH in the ZOI for any uniform area is less than or equal to 100 µg/g based on analysis of three composite samples collected as described in Condition III.LT.J.7.a.iii., and evaluated using statistical methods established through III.LT.K.3.a. Based on the PQLs as defined in Condition III.LT.J.4.b.xi. achieved for the soil analyses, the Department reserves the right to determine whether estimated values below the PQLs shall be added to the total PAH value, and

ii. The decrease in total PAH concentration has been less than 20% from the previous year; and

iii. ZOI soils for any uniform area are nontoxic, as determined through the Microtox test or an equivalent bioassay. The Microtox test is described in Attachment III.LT.20.ii. All three composite samples for each uniform area, collected as described in Condition III.LT.J.7.a.iii., shall be nontoxic. If Microtox is used, "nontoxic" shall mean a 15-minute EC50 greater than 100. If a different bioassay is used, the Permittee shall first submit to the Department for approval a description of the test, and supporting information for a "nontoxic" determination.

3. Closure Period

During either Option A and Option B closure period, the Permittee shall:

a. Continue all operations specified in this permit necessary to maximize degradation, transformation, of immobilization of hazardous constituents within the treatment zone, including tillage, moisture control, nutrient and pH control.

b. Continue all operations in the treatment zone to minimize run-off of hazardous constituents, including maintenance of the runoff management structures specified in Condition G.1.b. of this Module.

c. Maintain the run-on management structures required under the terms of this permit in Condition G.1.a. of this Module.

d. Control wind dispersal of hazardous waste as required in Condition F.8. of this Module.

e. Continue to comply with prohibitions and conditions concerning growth of food chain crops under Condition I. of this Module.

f. Maintain the necessary financial assurance arrangements to carry out closure and post-closure activities.

g. Continue unsaturated zone monitoring in compliance with Conditions J.6., J.7., and J.8. of this Module, with the following exceptions:

i. Soil-pore liquid monitoring may be terminated not less than 90 days following the last application of wastes to uniform areas.

ii. Soil sampling frequency shall decrease to annually after three years in the closure period.

iii. Microtox or an equivalent bioassay shall be required on three composite samples for each uniform are, collected as described in Condition III.LT.J.7.a.iii.

iv. A GC/MS analysis shall be performed on one composite ZOI sample and one uncomposited TZ and BTZ sample collected for each uniform area. Both base/neutral and acid extraction fractions shall be analyzed.

h. Groundwater analysis during the closure period shall be performed in accordance with the requirements in Condition IV.LT.H.

Establish a vegetative cover on the portion of the land application area(s) being closed at such time that the cover will not substantially impede degradation, transformation, or immobilization of hazardous constituents in the treatment zone. The criteria outlined in Conditions N.2.a. and N.2.b. or N.2.c. and N.2.d. of this Module must be met before a vegetative cover is established. The vegetative cover must be capable of maintaining growth without extensive supplemental irrigation and shall be planted as described in Attachment III.LT.21.

4. Post-Closure Period

When the closure period has been completed in Condition N.3.i. of this Module, the Permittee shall submit to the Department certification by an independent qualified soil scientist, in lieu of an independent registered professional engineer, that the facility has been closed in accordance with the specifications in the approved closure plan and this permit. During the post-closure period, the Permittee must:

a. Continue all operations specified in this permit necessary to maximize degradation, transformation, or immobilization of hazardous constituents within the treatment zone, including nutrient and pH control, except to the extent they are inconsistent with Condition N.3.i. of this Module.

b. Maintain the vegetative cover over closed portions of the facility as required under Condition N.3.i. of this Module.

c. Continue all operations in the treatment zone to minimize run-off of hazardous constituents, including maintenance of the runoff management structures required under the terms of the Permit as specified in Condition G.1.b.

d. Maintain the run-on management system required under the terms of this permit, specifically the structures specified in Condition G.1.a. of this Module.

e. Control wind dispersal of hazardous waste as required in Condition F.8. of this Module.

f. Continue to comply with prohibitions and conditions concerning growth of food chain crops under Condition I. of this Module.

g. Continue BTZ monitoring in compliance with Condition J.8. of this Module, but with decreasing frequency, during the post-closure period:

- one-half year after vegetation is established
- one year after vegetation is established
- two years after vegetation is established
- four years after vegetation is established
- eight years after vegetation is established
- sixteen years after vegetation is established
- thirty years after vegetation is established

During the post-closure period, the Department may decide that more frequent below treatment zone soil monitoring is necessary, at which time the Department will notify the Permittee in writing. Examples of conditions that could warrant more frequent BTZ sampling would be the appearance of hazardous constituents in groundwater immediately downgradient of the land treatment units or inadvertent damage to the vegetative cover.

h. Continue groundwater monitoring in accordance with Module IV.LT.H.

i. The Permittee shall no longer be subject to Conditions N..4.a. through N.4.h. of this Module at such time as the Permittee can demonstrate to the Department that the level of hazardous constituents, including metals, in the treatment zone soil does not exceed the background value of those constituents by an amount that is statistically

significant when using a test as specified in 40 CFR 264.280(d)(3), as incorporated by reference in ARM 16.44.702.

j. The post-closure care period shall extend for 30 years, unless the post-closure plan is amended through a permit modification, as specified in 40 CFR 264.118(d), as incorporated by reference in ARM 16.44.702.

O. SPECIAL REQUIREMENTS FOR IGNITABLE OR REACTIVE WASTES

1. The Permittee must not apply ignitable or reactive wastes to the treatment zone unless the waste is immediately incorporated into the soil so that the resulting waste/soil mixture or dissolution of the material no longer meets the definition of ignitable or reactive waste under ARM 16.44.321 or ARM 16.44.323.

2. The waste is managed in such a way that it is protected from any material or conditions which may cause it to ignite or react.

P. SPECIAL REQUIREMENTS FOR INCOMPATIBLE WASTE

1. The Permittee must not place incompatible wastes, or incompatible wastes and materials in or on the same treatment zone, unless 40 CFR 264.17, as incorporated in ARM 16.44.702, is complied with.

Q. SPECIAL REQUIREMENTS FOR HAZARDOUS WASTES PROHIBITED FROM LAND DISPOSAL

1. EPA Hazardous Waste Numbers F001, F002, F003, F004, F005, F020, F021, F022, F023, F026, and F027, and soils that have

been contaminated by these wastes, are prohibited from placement in the land treatment unit.

MODULE IIILT--LAND TREATMENT UNIT
LIST OF ATTACHMENTS

III.LT.1. Concentration Limits for Metals in Liquid Hazardous Wastes
III.LT.2. Maximum Allowable Metal Accumulations
III.LT.3. General Location of the Paradise Tie Plant
III.LT.4. Facility Plan, the Paradise Tie Plant Land Treatment Unit
III.LT.5. Principal Hazardous Constituents
III.LT.6. Loading Rates Used in the Land Treatment Demonstration Studies
III.LT.7. Land Treatment Unit Inspection Schedule
III.LT.8. Land Treatment Unit Inspection Checklist
III.LT.9. Land Treatment Unit Monitoring Schedule
III.LT.10. Land Treatment Unit Uniform Areas (cells)
III.LT.11. Soil Core Monitoring (Section 37.3)
III.LT.12. Summary of Test Methods for Land Treatment Monitoring Program
III.LT.13. HPLC QA/QC Requirements
III.LT.14. GCMS QA/QC Requirements
III.LT.15. Volatile Aromatics QA/QC Requirements
III.LT.16. Waste Analysis Plan (Chapter 7)
III.LT.17. Soil-Pore Water Monitoring (Section 37.4)
III.LT.18. Modified Soil Sampling Procedure
III.LT.19. Recommended Statistical Approach
III.LT.20. PAH Constituents Used in Closure Performance Standard
III.LT.21. Closure/Post-Closure Plan

Concentration Limits for Metals in Liquid Wastes Applied to Land Treatment Units

(i) Arsenic and/or compounds (as As) 500 mg/1;

(ii) Cadmium and/or compounds (as Cd) 100 mg/1;

(iii) Chromium (VI) and/or compounds (as Cr VI) 500 mg/1;

(iv) Lead and/or compounds (as Pb) 500 mg/1;

(v) Mercury and/or compounds (as Hg) 20 mg/1;

(vi) Nickel and/or compounds (as Ni) 134 mg/1;

(vii) Selenium and/or compounds (as Se) 100 mg/1; and

(viii) Thallium and/or compounds (as T1) 130 mg/1.

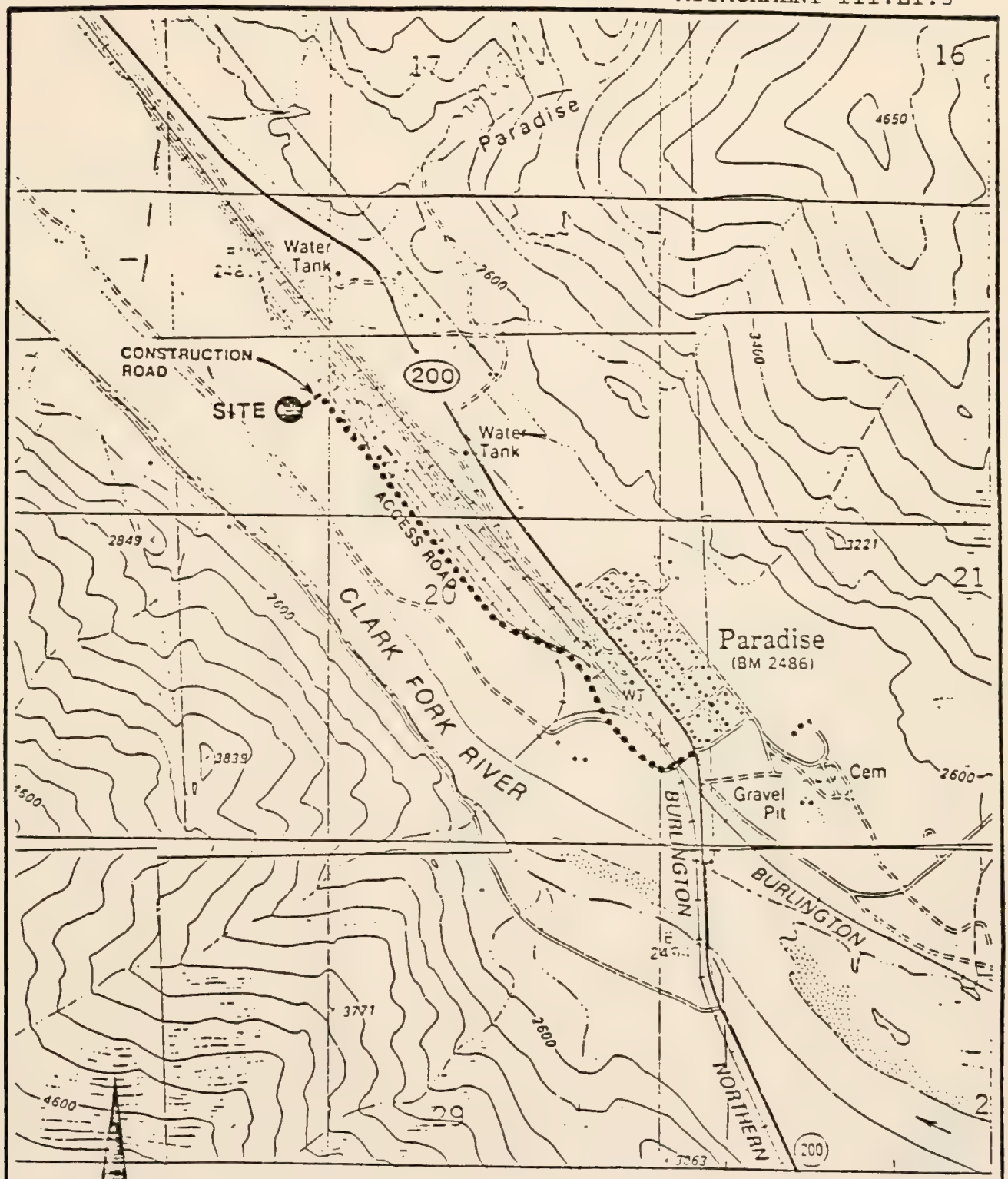
Adapted from the Hazardous and Solid Waste Act California list criteria, RCRA Section 3004(d)(2)(B).

MAXIMUM ALLOWABLE METAL ACCUMULATIONS IN ZONE OF INCORPORATION SOILS

Parameter	Maximum Allowable Levels
Antimony	250 ppm[1]
Arsenic	300 ppm[2]
Barium	500 ppm[1]
Beryllium	50 ppm[2]
Cadmium	3 ppm[2]
Chromium	1000 ppm[2]
Cobalt	200 ppm[2]
Copper	250 ppm[2]
Lead	1000 ppm[2]
Mercury	10 ppm[1]
Nickel	100 ppm[2]
Selenium	5 ppm[2]
Vanadium	500 ppm[2]
Zinc	500 ppm[2]

1. Values established from SW-874, Hazardous Waste Land Treatment, EPA, 1983, Table 6.52. The levels have been converted from Kg/ha-30 cm units to ppm, assuming a soil density of 1.35 g/cm^3.

2. Values established from SW-874, Hazardous Waste Land Treatment, EPA, 1983, Tab.e 6.47. The values are compiled from a literature review in SW-874, and are "based on microbial and plant toxicity limits, animal health considerations, and soil chemistry which reflects the ability of the soil to immobilize the metal elements" (p. 272).

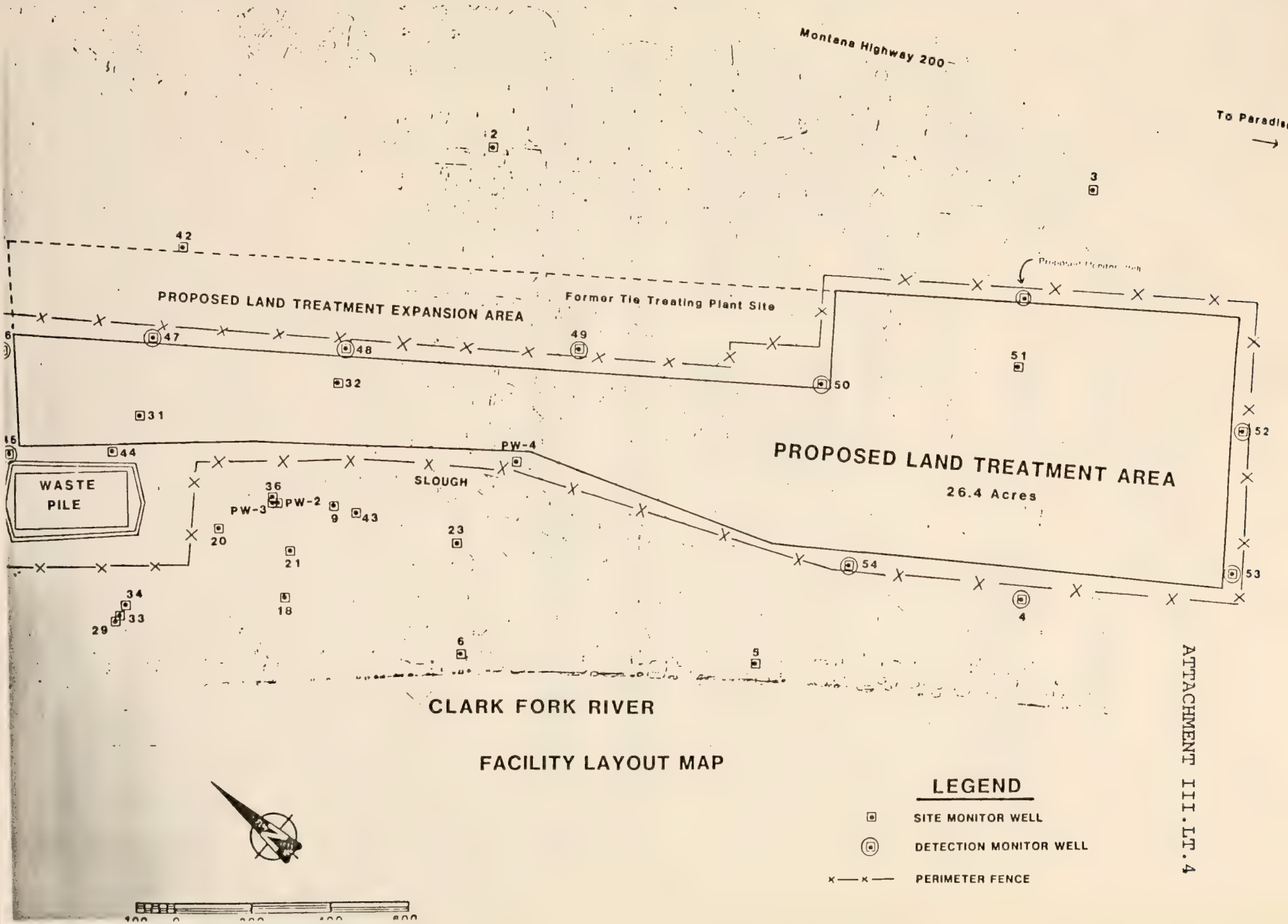


B.N. PARADISE PART B

AREA ROADS

	10/6/95	14-1
	D-898	

ERT



FACILITY LAYOUT MAP

LEGEND

- SITE MONITOR WELL
- DETECTION MONITOR WELL
- PERIMETER FENCE

ATTACHMENT III.LT.4

Principal Hazardous Constituents
for
Exxon Land Treatment Units

Organics	Metals	Other*
Volatiles	- arsenic	- pH
	- lead	- specific conductance (lysimeter samples only)
- benzene		- Benzene extractables
- ethylbenzene		
- toluene		
- xylenes (m,o,p)		

Polycyclic Aromatic Hydrocarbons

-acenaththene	-chrysene
-acenaphthylene	-dibenzo(a,h)anthracene
-anthracene	-fluoranthene
-benzo(a)anthracene	-fluorene
-benzo(a)pyrene	-indeno(1,2,3-cd)pyrene
-benzo(b)fluoranthene	-naththalene
-benzo(ghi)perylene	-phenanthrene
-benzo(k)fluoranthene	-pyrene

To be evaluated routinely in soil-pore liquid and below treatment zone soils.

* Although these parameters are to be evaluated routinely, their variation or change will not be interpreted as indicating the presence of hazardous constituents.

TABLE 33-1

LOADING RATES USED IN THE PLOT STUDIES

CONSTITUENT	CONCENTRATION* AT REAPPLICATION (UG/G)	APPLICATION ** RATE (LBS/ACRE)
NAPHTHALENE	27	67.5
ACENAPHTHENE	269	672.5
FLUORENE	859	2147.5
PHENATHRENE/ANTHRACENE	5484	13710
FLUORANTHENE	4008	10020
PYRENE	2875	7187.5
BENZO(A)ANTHRACENE/CHRYSENE	845	2112.5
BENZO FLUORANTHENES	309	772.5
BENZO(A)PYRENE	301	752.5
BENZENE EXTRACTABLES	64100	160250

* = average concentrations in Plot 1 immediately following waste reapplication

** = Based on a soil bulk density of 1.4 g/cc, concentrations measured in the ZOI at a ZOI depth of 8 inches.

TABLE 9-1

INSPECTION SCHEDULE FOR THE LAND TREATMENT FACILITY
AND OPERATING EQUIPMENT

ITEM	PURPOSE	POTENTIAL PROBLEMS	FREQUENCY
Fencing/Gates	Limit Access	Damage	Weekly
Berms and Dikes	Run-on and Run-off Control	Erosion	Weekly
Monitor Wells	Water Levels and Water Quality Samples	Damage,caps locked, and surface seals	Quarterly
Safety Equipment	Accident Use	Availability	Weekly
Storm Water Pond	Collection of storm water	Presence of excess liquids	Weekly

FIGURE 9-1

INSPECTION LOG FOR PARADISE LAND TREATMENT FACILITY
BURLINGTON NORTHERN RAILROAD

Inspector: _____ Date: _____

Fencing/Gates:

Gates closed? _____

Broken wires? _____

Condition of posts? _____

Safety Equipment:

Available? _____

Access? _____

Condition? _____

Monitor Wells:

Damage? _____

Caps locked? _____

Surface seal condition? _____

Storm Water Pond:

Presence of water? _____

Estimated quantity of water? _____

Treatment Area:

Erosion? _____

Run-off/Run-on controls? _____

Berms:

General condition? _____

Erosion? _____

LAND TREATMENT OPERATIONAL
MONITORING SCHEDULE - WASTES AND UNSATURATED ZONE

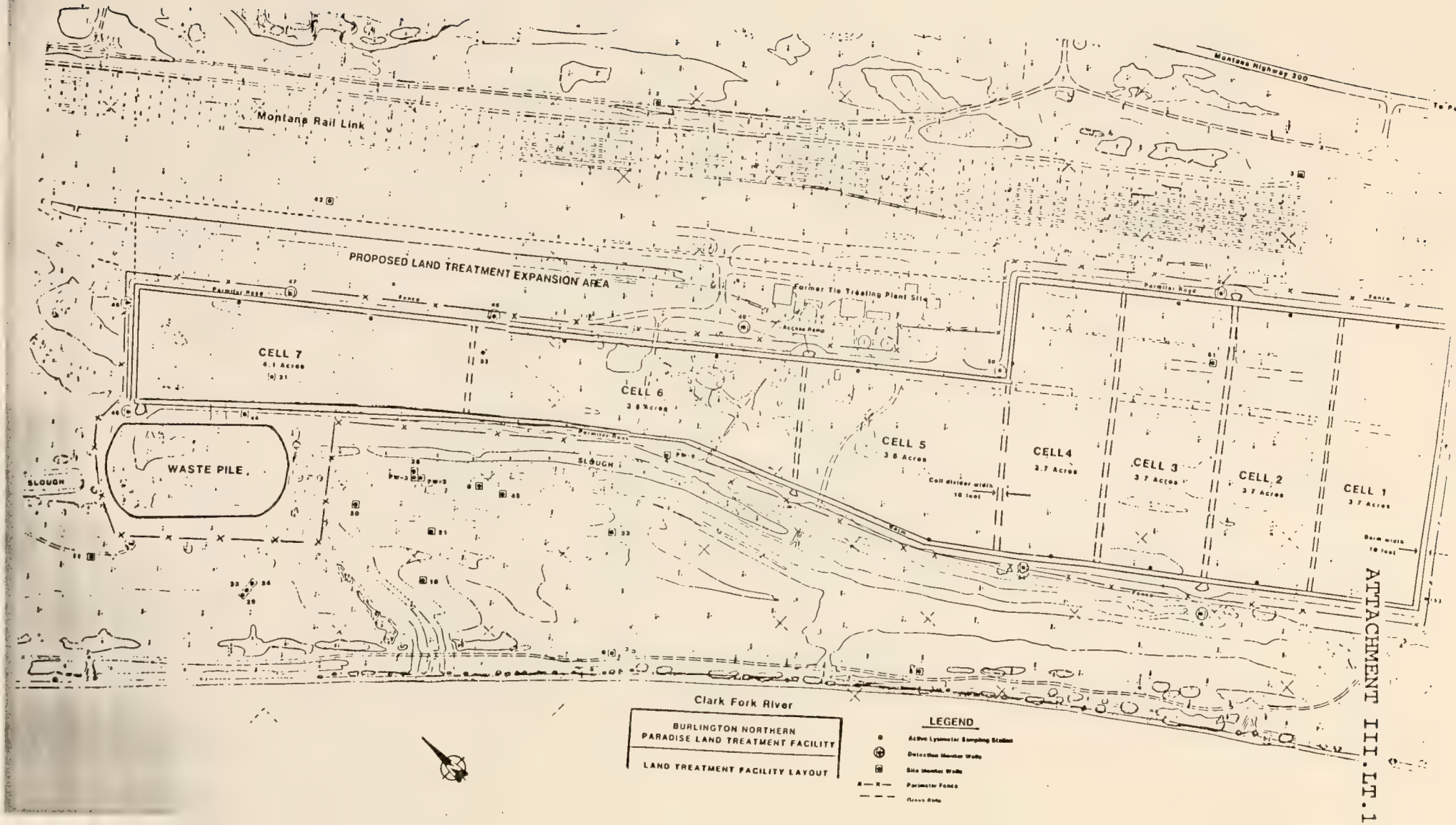
SAMPLE TYPE	SAMPLING METHODS AND FREQUENCY				PARAMETERS								
	Compositing	Unit Area	Frequency	Annual Total	Benzene Extractables	PAHs	PHCs	pH	Nutrients N.P.	Metals	Microtox	BNAs*
Wastes	Yes		Twice daily during application	Variable	X (2 daily)	X (1 daily)						
Wastes	Yes		Beginning and end of application	Minimum 2			X	X		X		
Soil-Pore Liquid	No	2/4-acre uniform area, & 2 background	3/waste Application	Minimum 48			X					
ZOI soils	Yes	Alternate 100 x 100 ft. plots	Daily during application	Variable	X							
ZOI soils	Yes	3/4-acre uniform area	Semi-annually	42			X	X	X	X	X	X (background and first semi-annual event only)
TZ soils	No	2/4-acre uniform area	Semi-annually	28			X					X
BTZ soils	No	2/4-acre uniform area	Semi-annually	28			X					X

*BNAs are base/neutral and acid extractable semivolatile organic compounds.

MR/vg-32xt

ATTACHMENT III.LT.9

1"=Approximately 320'



ATTACHMENT III.LT.1

37.2.4 Land Treatment Facility Description

Chapter 39 (Design, Operation and Maintenance Plan) details the facility description. The land treatment facility consists of one landfarm with seven cells each approximately four acres in size. Monitoring requirements will include sampling soil cores and soil-pore water for an active facility 26 acres in size.

37.3 Soil Core Monitoring

37.3.1 Sampling Locations and Depths

A one-time event of eight randomly selected soil cores will be collected from the facility prior to waste application for background monitoring requirements. Two active soil cores will be collected semiannually every four acres or 14 cores for the 26 acre facility.

Sampling locations will be selected for the background cores and active cores using the following procedure:

1. Two random numbers will be selected from a random numbers table (see Table 37-1). These numbers will be used to locate two points along a coordinate grid for each land treatment area.

2. The intersection point of two lines drawn perpendicular to the two base line points will be located. This intersection point represents one randomly selected location for collection of one soil core. If the point of intersection is outside the land treatment unit, or within 10 meters of another sampling location, the sampling location will be disregarded and the above procedure will be repeated.

3. Steps 1 and 2 will be repeated as many times as necessary to obtain eight coring locations for the background monitoring and 20 cores for the active monitoring in Cell 1.

The soil core sampling program is designed to detect hazardous constituents migrating through the treatment zone. The sampling depth intervals for each boring will be:

'Table of Random Unus

X-COORDINATES

Line/Col.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1	10480	15011	01536	02011	81647	91646	69179	14194	62590	36207	20969	99570	91291	90700
2	22368	46573	25595	85393	30995	89198	27982	53402	93965	34095	52666	19174	39615	99505
3	24130	48360	22527	97265	76393	64809	15179	24830	49340	32081	30680	19655	63348	58629
4	42167	93093	06243	61680	07856	16376	39440	53537	71341	57004	00849	74917	97758	16379
5	37570	39975	81837	16656	06121	91782	60468	81305	49684	60672	14110	06927	01263	54613
6	77921	06907	11008	42751	27756	53498	18602	70659	90655	15053	21916	81825	44394	42880
7	99562	72905	56420	69994	98872	31016	71194	18738	44013	48840	63213	21069	10634	12952
8	96301	91977	05463	07972	18876	20922	94595	56869	69014	60045	18425	84903	42508	32307
9	89579	14342	63661	10281	17453	18103	57740	84378	25331	12566	58678	44947	05585	56941
10	85475	36857	43342	53988	53060	59533	38867	62300	08158	17983	16439	11458	18593	64952
11	28918	69578	88231	33276	70997	79936	56865	05859	90106	31595	01547	85590	91610	78188
12	63553	40961	48235	03427	49626	69445	18663	72695	52180	20847	12234	90511	33703	90322
13	09429	93969	52636	92737	88974	33488	36320	17617	30015	08272	84115	27156	30613	74952
14	10365	61129	87529	85689	48237	52267	67689	93394	01511	26358	85104	20285	29975	89868
15	07119	97336	71048	08178	77233	13916	47564	81056	97735	85977	29372	74461	28551	90707
16	51085	12765	51821	51259	77452	16308	60756	92144	49442	53900	70960	63990	75601	40719
17	02368	21382	52404	60268	89368	19885	55322	44819	01188	65255	64835	44919	05944	55157
18	01011	54092	33362	94904	31273	04146	18594	29852	71585	85030	51132	01915	92747	64951
19	52162	53916	46369	58536	23216	14513	83149	98736	23495	64350	94738	17752	35156	35749
20	07056	97628	33787	09998	42698	06691	76988	13602	51851	46104	88916	19609	25625	58104
21	48663	91245	85828	14346	09172	30168	90229	04734	59193	22178	30421	61666	99904	32812
22	54164	58492	22421	74103	47070	25306	76468	26384	58151	06646	21524	15227	96909	44592
23	32639	32363	05597	24200	13363	38005	94342	28728	35806	06912	17012	64161	18296	22851
24	29334	27001	87637	87308	58731	00256	45834	15398	46557	41135	10367	07684	36188	18510
25	02488	33062	28834	07351	19731	92420	60952	61230	50001	67658	32586	86879	50720	94953
26	81525	72295	04839	96423	24878	82651	66566	14778	76797	14780	13300	87074	79666	95725
27	29676	20591	68086	26432	46901	20849	89768	81536	86645	12659	92259	57102	80428	25280
28	00742	57392	39064	66432	84673	40027	32832	61362	98947	96067	64760	64584	96096	98253
29	05366	04213	25669	26422	44407	44048	37937	63904	45766	66134	75470	66520	34693	90449
30	91921	26418	64117	94305	26766	25940	39972	22209	71500	64568	91402	42416	07844	69618
31	00682	04711	87917	77341	42206	35126	74087	99547	81817	42607	43808	76655	62028	76630
32	00725	69884	62797	56170	86324	68072	76222	36086	84637	93161	76038	65855	77919	88006
33	69011	65797	95876	55293	18968	27354	26575	08625	40801	59920	29841	80150	12777	48501
34	25976	57948	29888	88604	67917	48708	18912	82271	65424	69774	33611	54262	85963	03547
35	09763	83473	73577	12908	30883	18317	28290	35797	05998	41688	34952	37888	38917	88050
36	91567	42595	27958	30134	04024	86385	29880	99730	55536	84855	29080	09250	79656	73211
37	17955	56349	90999	49127	20044	59931	06115	20542	18059	02008	73708	83517	36103	42791
38	46503	18584	18845	49618	02304	51038	20655	58727	28168	15475	56942	53389	20562	87338
39	92157	89634	94824	78171	84610	82834	09922	25417	44137	48413	25555	21246	35509	20468
40	14577	62765	35605	81263	39667	47358	56873	56307	61607	49518	89656	20103	77490	18062
41	98427	07523	33362	64270	01638	92477	66969	98420	04880	45585	46565	04102	46880	45709
42	34914	63976	88720	82765	34476	17032	87589	40836	32427	70002	70663	88863	77775	69348
43	70060	28277	39475	46473	23219	53416	94970	25832	69975	94854	19661	72828	00102	66794
44	53976	54914	06990	67245	68350	82948	11398	42878	80257	88267	47363	46634	06541	97809
45	76072	29515	40980	07391	58745	25774	22987	80059	39911	96189	41151	14222	60697	59583
46	90725	52210	83974	29992	65831	38857	50490	83765	55657	14361	31720	57375	56228	41546
47	64364	67412	33339	31926	14883	24413	59744	92351	97473	89286	35931	04110	23726	51900
48	08962	00358	31662	25388	61642	34072	81249	35648	56891	69352	48373	45578	78547	81788
49	95012	68379	93526	70765	10593	04542	76463	54328	02349	17247	28865	14777	62730	92277
50	15664	10493	20492	38391	91132	21999	59516	81652	27195	48223	46751	22923	32261	85653

TABLE 37-1 (cont.)

III.LT.11 CONT'D.

Table of Random Units

Y-COORDINATES

Line/Col.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
51	16408	81899	04153	53381	79401	21438	83035	92350	36693	31238	59649	91754	72772	02236
52	18629	81953	05520	91962	04739	13092	97662	24822	94730	06496	35090	04822	86772	78291
53	73115	35101	47498	87637	99016	71060	88824	71013	18735	20286	23153	72924	35165	43040
54	57491	16703	23167	49323	45021	33132	12544	41035	80780	45393	44812	12515	98931	91227
55	30405	83946	23792	14422	15059	45799	22716	19792	09983	74353	68668	30429	70735	25499
56	16631	35006	85900	98275	32388	52390	16815	69298	82732	38480	73817	32523	41961	44437
57	96773	20206	42539	78985	05300	22164	24369	54224	35083	19687	11052	91491	60383	19746
58	38935	64202	14349	82674	66523	44133	00697	35552	35970	19124	63318	29686	03287	39444
59	31624	76384	17403	53363	44167	64486	64758	75366	76554	31601	12614	33072	60332	92725
60	78919	19474	23632	27889	47914	02584	37680	20801	72152	39339	34806	08930	85001	87820
61	03931	33309	57047	74211	63445	17361	62825	39908	05607	91284	66833	25570	38818	46920
62	74426	33278	43972	10119	89917	15665	52872	73823	73144	88662	88970	74492	51805	99378
63	09066	00903	20795	95452	92648	45454	09552	88815	16553	51125	79375	97596	16296	66099
64	42238	12426	87025	14267	20979	04508	64535	31355	86064	29472	47689	05974	52468	16834
65	16153	08002	26504	41744	81959	65642	74240	56302	00033	67107	77510	70625	25725	34191
66	21457	40742	29820	96783	29400	21840	15035	34837	33310	06116	95240	15957	16572	06004
67	21581	57802	02050	89728	17937	37621	47075	42080	97403	48626	68995	43805	33386	21597
68	55612	78095	83197	33732	05810	24813	86902	60397	16489	03264	88525	42786	05269	92532
69	44657	66999	99324	51281	84463	60563	79312	93454	68876	25471	93911	25650	12682	73572
70	91340	84979	46949	81973	37949	61023	43997	15263	80644	43942	89203	71796	99533	50501
71	91227	21199	31935	27022	84067	05462	35216	14486	29891	68607	41867	14951	91696	85065
72	50001	38140	66321	19924	72163	09538	12151	06878	91903	18749	34405	56087	82790	70925
73	65390	05224	72958	28609	81406	39147	25549	48542	42627	45233	57202	94617	23772	07896
74	27504	96131	83944	41575	10573	08619	64482	73923	36152	05184	94142	25299	84387	34925
75	37169	94851	39117	89632	00959	16487	65536	49071	39782	17095	02330	74301	00275	48280
76	11508	70225	51111	38351	19444	66499	71945	05422	13442	78675	84081	66938	93654	59894
77	37449	30362	06694	54690	04052	53115	62757	95348	78662	11163	81651	50245	34971	52924
78	46515	70331	85922	38329	57015	15765	97161	17869	45349	61796	66345	81073	49106	78660
79	30986	81223	42416	58353	21532	30502	32305	86482	05174	07901	54339	58861	74818	46942
80	63798	64995	46583	09765	44160	78128	83991	42865	92520	83531	80377	35909	81250	54238
81	82486	84846	99254	67632	43218	50076	21361	64816	51202	88124	41870	52689	51275	83556
82	21885	32906	92431	09060	64297	51674	64126	62570	26123	05155	59194	52799	25225	35782
83	60336	98782	07408	53458	13564	59089	26445	29789	85205	41001	12535	12133	14645	22541
84	43937	46891	24010	25560	86355	33941	25786	54990	71899	15475	95434	98227	21824	19585
85	97656	63175	89303	16275	07100	92063	21942	18611	47348	20203	18534	03862	78095	50136
86	03299	01221	05418	38982	55758	92237	26739	86367	21216	98442	08303	56613	91511	75928
87	79626	06486	03574	17668	07785	76020	79924	25651	83325	88428	85076	72511	22717	50585
88	85636	68335	47539	03129	65651	11977	02510	26113	99447	68645	34327	15152	55230	93448
89	18039	14367	61337	06177	12143	46609	32989	74014	64708	00533	35398	58408	13261	47908
90	08362	15656	60627	36478	65648	16764	53412	09013	07832	41574	17639	82163	60859	75567
91	79656	29068	04142	16268	15387	12856	66227	38358	22478	73373	88732	09443	82558	05250
92	92608	82674	27072	32534	17075	27698	98204	63863	11951	34648	88022	56148	34925	57031
93	23982	25835	40065	67006	12293	02753	14827	22235	35071	99704	37543	11601	35503	85171
94	09915	96306	05908	97901	28395	14186	00821	80703	70426	75647	76310	88717	37890	40129
95	50937	33300	26695	62247	69927	76123	50842	43834	86654	70959	79725	93872	25117	19233
96	42488	78077	69882	61657	34136	79180	97526	43092	04098	73571	80799	76536	71255	64239
97	46764	86273	63003	93017	31204	36692	40202	35275	57306	55543	53203	18098	47625	88684
98	03237	45430	55417	63282	90816	17349	88298	90183	36600	78406	06216	95787	42579	90730
99	86591	81482	52667	61583	14972	90053	89534	76036	49199	43716	97548	04379	46370	28672
100	38534	01715	94964	87288	65680	43772	39560	12918	86537	62738	19636	51132	25739	56947

A) 0-12 inches (Zone of Incorporation)
B) 36-54 inches (Treatment Zone)
C) 60-66 inches (Below Treatment Zone)

All samples will be analyzed by HPLC Method 8310 for Polynuclear Aromatic Hydrocarbons. ZOI samples will also be analyzed for oil and grease, pH, and nutrients.

37.3.2 Sampling Locations

Soil cores will be collected using a truck-mounted hollow stem auger and a two and one half inch split spoon sampler or three inch Shelby tubes. The following procedure will be used for obtaining soil core samples:

1. Drill down to the required depth using a hollow stem auger.

2. Detach the head assembly from the auger.

3. With the split spoon attached to the head assembly and drive rod, pass the tube down through the hollow stem and into the soil to the required depth (six, 12 or 18 inches). In most applications a 140 lb hammer is used to drive the split spoon. However, in soft soils the split spoon can often be forced in to the ground by the hydraulic drawdown on the drill rig.

4. Pull the split spoon out of the soil using the hoist assembly.

5. Remove and discard the first two or three inches of the sample.

6. Extrude the remaining sample into a sample container. Label the sample container.

7. Pour soil and bentonite into the soil cavity, periodically tamping to increase the bulk density. Fill the hole to the ground surface.

8. Decontaminate the auger flights with a steam cleaner between borings.

9. Decontaminate the split spoon sampler with detergent, methanol, and deionized water.

ANALYTICAL METHODS FOR WASTES, SOILS, AND SOIL PORE-SAMPLES

Analysis	Method
1. Metals	SW-846 3rd Edition Method
Antimony	3010 and 6010
Arsenic	3010 and 7061
Barium	3010 and 6010
Beryllium	3010 and 6010
Cadium	3010 and 6010
Chromium	3010 and 6010
Cobalt	3010 and 6010
Copper	3010 and 6010
Lead	3010 and 6010
Mercury	3010 and 7470/7471
Nickel	3010 and 6010
Selenium	3010 and 7741
Thallium	3010 and 6010
Vanadium	3010 and 6010
Zinc	3010 and 6010
2. Organics	
Volatiles	8020
PAHs by HPLC	8310
PAHs by GC/MS	8270
Benzene extractables	9071, modified to use benzene* as extraction solvent
3. Other	
Soil pH	9045 or equivalent
Soil N and P	"Methods of Soil Analysis: Publication 9 in the series Agronomy, published jointly by the American Society of Agronomy and ASTM (or equivalent)

* Benzene should leave no residue on evaporation, and must be distilled if necessary.

QUALITY CONTROL/QUALITY ASSURANCE REQUIREMENTS for HPLC Analysis of Principal Hazardous Constituents

The following describes minimum QA/QC analysis which must be performed and reported by the laboratory as described in SW846. Attached are Forms 1-7 which when completed comprise a complete analytical report, including sample results (Form 1).

I. Initial Demonstration of precision and accuracy and calculation of Method Detection Limits (MDL's)

On an initial basis, the analyst must establish the ability to generate acceptable accuracy, precision, and method detection limits by performing the following operations:

A. A quality control (QC) check sample concentrate is required containing each regulated analyte. The QC check sample is spiked into reagent water at a concentration between one and five times the estimated MDL. The QC check sample must be prepared by the laboratory using stock standards prepared independently form those used for calibration. A minimum of seven aliquots of the spiked samples are processed through the entire analytical method.

B. Calculate the average recovery ($\overline{x}$) in µg/L for each analyte using the seven results. Calculate the MDL according to Glaser et al. (Env. Sci. Tech., Vol. 15(12), 1981, pp. 1426-1435.).

C. For each parameter, compare the average recovery ($\overline{x}$) in µg/L with the corresponding acceptance criteria for accuracy and precision found in Table 4 of 8310. If s and $\overline{x}$ for all parameters of interest meet the acceptance criteria, the system performance is acceptable and analysis of actual samples can begin. If any individual $\overline{x}$ falls outside the range for accuracy, or if any individual s exceeds the precision limit, the system performance is unacceptable for that parameter.

D. Refer to the upper and lower control limits for MDL's as cited in Glaser et al. If the calculated MDL's for each parameter are within these limits, then the system performance is acceptable.

E. Reporting Requirements

Refer to Form 2 to report the above information.

II. On-going analysis of spiked samples and blanks

For each analytical batch (up to twenty samples) the following procedures must be carried out to evaluate and document the quality of the data:

A. Reagent blank

A method or reagent blank is an artificial sample designed to monitor the introduction of artifacts in the process. For each analytical batch, one method or reagent blank is prepared using reagent water. It is spiked with surrogates and carried through the analytical procedure. The percent recovery of the surrogates is reported along with the other samples and spikes. Results of the blank analysis are reported on Form 3.

B. Matrix Spike (MS)/Matrix Spike Duplicate (MSD)

This section allows the determination of the extent of matrix bias or interference on analyte recovery (or accuracy) and determines sample-to-sample precision.

1. Procedure

With every analytical batch, the laboratory chooses one sample to split into three portions. One portion is analyzed as a sample, and the other two are spiked with the analytes of interest. These are called the matrix spike (MS) and matrix spike duplicate (MSD). The concentration of the matrix spike and the matrix spike duplicate should be at or near the regulatory level. For these purposes, the laboratory should choose a sample known to contain low levels of the analyte. The matrix spike and matrix spike duplicate are then carried through the extraction and analytical procedure.

2. Calculate and evaluate accuracy

a. Calculate percent recovery (P) and 100(A-B)%/T where A=concentration of the analyte in the spiked sample, B=the concentration of the analyte in the unspiked sample, and T is the true value of the spike.

b. Calculate the acceptance criteria for the recovery of an analyte. Refer to Table 4 of Method 8310 (SW846, 8310-12).

-Calculate accuracy (x') using the equation found in the Method Accuracy and Precision as a Function of Concentration Table, substituting the spike concentration (T) for C.

-Calculate the overall precision (S') using the equation in the same Table, substituting x' for $\bar{x}$.

-Calculate the range for recovery acceptance at the spike concentrations as $(100x'/T) \pm 2.44(100S'/T)\%$.

-After the analysis of five spiked samples of the same matrix, calculate the average percent recovery ($\bar{p}$) and the standard deviation of the percent recovery (s_p). Express the accuracy assessment as a percent recovery interval from $\bar{p}-2s_p$ to $\bar{p}+2s_p$. Update the accuracy for each analyte on a regular basis (e.g. after each 5 to 10 new accuracy measurements). The laboratory may use the updated accuracy assessment in lieu of those calculated from Table 4 (8310-12).

c. If an individual p falls outside of the designated range for recovery, that analyte has failed acceptance criteria. A check standard containing each analyte that failed the acceptance criteria must be analyzed. As an alternative, the laboratory may routinely analyze a QC check sample with each analytical batch.

Prepare the QC check standard as described in 8410 (8.2.1). Add 1.0 ml of the to 1000 ml of reagent water, extract and analyze according to the method. Compare percent recovery for each analyte with the corresponding QC acceptance criteria found in Table 3 of Method 8310 (p.11). If the accuracy of any of the analytes still falls outside the designated range established in Table 3 or by the laboratory, the laboratory performance for the analyte is judged to be out of control, and the problem must be identified and corrected. The results for that analyte in the unspiked samples are suspect and may not be reported for regulatory compliance purposes.

3. Calculate and evaluate precision.

a. Calculate precision as the relative percent difference (RPD) between the spike recoveries for each analyte of the matrix spike and the matrix spike duplicate: $RPD=(|MS_a-MSD_a|/\bar{x})x100$
where MS_a=Concentration of analyte a in the matrix spike, MSD_a=concentration of analyte a in the matrix spike duplicate and $\bar{x}$ is the average of the concentrations of analyte a in the matrix spike and matrix spike duplicate.

b. Referring to Table 4 (8310-12), calculate s_r' and the limit for the RPD for an individual analyte as $(s_r')/Tx100$.

After the analysis of five matrix spikes and five matrix spike duplicates, calculate the average RPD for each analyte. Update the precision assessment for each analyte on a regular basis (every 5-10 samples). The laboratory may use the average RPD as a precision assessment criteria in lieu of those calculated from Table 4(8310-12).

4. Reporting

When reporting analytical results, use Form 4, titled "Water Matrix Spike/Matrix Spike Duplicate Recovery" to report the quality control data described above.

C. Surrogate Spikes

Surrogates are organic compounds which are similar to analytes of interest in chemical composition, extraction, and chromatography, but which are not normally found in environmental samples. Their use allows the data quality of an individual sample to be evaluated.

For Method 8310, decafluorobiphenzl or other PAH's not expected to be in the sample may be used. These compounds are spiked into all blanks, standards, samples, and spiked samples prior to analysis. The laboratory may choose an appropriate level for surrogate spiking.

1. For each sample analyzed, calculate the percent recovery of each surrogate in the sample.

2. Once a minimum of thirty samples of the same matrix have been analyzed, calculate the average percent recovery ($\overline{p}$) and standard deviation of the percent recovery (s) for each of the surrogates.

3. For a given matrix, calculate the upper and lower control limits for method performance for each surrogate standard.

   Upper Control Limit (UCL) = $\overline{p}+3S$
   Lower Control Limit (LCL) = $\overline{p}-3S$

4. If the recovery is not within limits, the following is required:

   -Check to be sure that there are no errors in calculations, surrogate solutions, and standards. Also check instrument performance.

   -Recalculate the data and/or reanalyze the extract if any of the above checks reveal a problem.

   -Re-extract and reanalyze the sample if none of the above are a problem or flag the data as "estimated concentration."

5. As a minimum, the laboratory should update surrogate recovery limits annually.

6. Form 5, Water Surrogate Percent Recovery Summary, should be used to report results of this section.

III. CALIBRATION AND DAILY CALIBRATION CHECK

The laboratory may perform either an external standard calibration procedure (8000-2, 8310-3) or an internal standard calibration procedure (8000-3, 8310-4).

A. For the external standard procedure, if the percent relative standard deviation (%RSD) of the calibration factor (see equation below) is less

than 20% over the working range, then linearity through the origin can be assumed and the average calibration factor can be used in place of a calibration curve.

%RSD=$(R_1-R_2)/R_1$X100 where R_1 = Calibration Factor from the first analysis R_2 = Calibration Factor from succeeding analysis.

B. For internal standards procedure, if the response factor (RF) over the working range is constant (< 20% RSD), the RF can assumed to be invariant and the average RF can be used.

RF=$(A_sC_{is})/(A_{is}C_s)$ where: A_s=Response for the analyte to be measured
A_{is}=Response for the internal standard
C_{is}=Concentration of the internal standards, µg/L
C_s=Concentration of the analyte to be measured, µg/L

C. Whether the external or internal standard procedure is used, the working calibration curve or calibration factor must be verified on each working day by the injection of one or more calibration standards. If the response for any analyte varies from the predicted response by more than ±15%, a new calibration curve must be prepared for that compound.

D. Form 6, Initial Data Calibration, is used to report the results of the initial calibration.

E. Form 7, Retention Time Windows and Calibration Verification, is used to report the information acquired in C and in IV below.

IV. RETENTION TIME WINDOWS

Retention time windows are necessary to properly identify compounds. The laboratory may use the guidance of SW846, 8000-4,5 and the experience of their analysts to set retention time windows. Form 6 is used to report these windows.

Form 1. ORGANIC ANALYSIS DATA SHEET

Sample No.
_____

Laboratory Name: _____
Lab Sample ID No: _____
Sample Matrix: _____
Date Extracted: _____
Date Analyzed: _____
Conc/Dilution Factor: _____

Date Sample Collected: _____
Date Sample Received: _____
Date Reported From Lab: _____
Extraction Method: _____
Analytical Method: _____

Compound	Retention Time	Concentration	Units
Naphthalene			
Acenaphthylene			
Acenaphthene			
Fluorene			
Phenanthrene			
Anthracene			
Fluoranthene			
Pyrene			
Benzo(a)anthracene			
Chrysene			
Benzo(b)fluoranthene			
Benzo(k)fluoranthene			
Benzo(a)pyrene			
Benzo(ghi)perylene			
Dibenzo(ah)anthracene			
Indeno(123-cd)pyrene			

Form 2. INITIAL DEMONSTRATION OF ACCURACY, PRECISION, AND METHOD DETECTION LIMITS (MDL)

Date Initial Demonstration Performed: _____

Laboratory: _____ Method: _____

Compound	x	QC Limits	s	QC Limits	MDL	QC Limits
Naphthalene						
Acenaphthylene						
Acenaphthene						
Fluorene						
Phenanthrene						
Anthracene						
Fluoranthene						
Pyrene						
Benzo(a)anthracene						
Chrysene						
Benzo(b)fluoranthene						
Benzo(k)fluoranthene						
Bezo(a)pyrene						
Benzo(ghi)Perylene						
Dibenzo(ah)anthracene						
Ideno(123-cd)pyrene						

Form 3. METHOD BLANK SUMMARY

Laboratory: _____ Date: _____

Method: _____

Compounds	Concentration (µg/L)
Naphthalene	
Acenaphthylene	
Acenaphthene	
Fluorene	
Phenanthrene	
Anthracene	
Fluoranthene	
Pyrene	
Benzo(a)anthracene	
Chrysene	
Benzo(b)fluoranthene	
Benzo(k)fluoranthene	
Benzo(a)pyrene	
Benzo(ghi)Perylene	
Dibenzo(ah)anthracene	
Ideno(123-cd)pyrene	

Form 4. WATER MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Sample # _____ Laboratory Name: _____ Method: _____

Date: _____

Compound	Conc. Spike Added(ug/L)	Sample Result(ug/L)	Concentration Matrix Spike	% Recovery	Concentration Matrix Spike Duplicate	% Recovery	RPD	QC Limits RPD	QC Limits % Recovery
Naphthalene									
Acenaphthylene									
Acenaphthene									
Fluorene									
Phenanthrene									
Anthracene									
Fluoranthene									
Pyrene									
Benzo(a)anthracene									
Chrysene									
Benzo(b)fluoranthene									
Benzo(k)fluoranthene									
Benzo(a)pyrene									
Benzo(ghi)Perylene									
Dibenzo(ah)anthracene									
Ideno(123-cd)pyrene									

Form 5. WATER SURROGATE PERCENT RECOVERY SUMMARY

Laboratory Name: _____ Method: _____

Date: _____

Sample #/I.D.	Surrogate 1 % Recovery	QC Limits LCL-UCL	Surrogate 2 % Recovery	QC Limits LCL-Ucl

Form 6. Initial Calibration Data

Laboratory: _____ Method: _____

Date: _____

Internal or External Standards Calibration Procedure: _____

Nanograms:	RF	RF	RF	RF	RF	RF	%RSD
Compound							
Naphthalene							
Acenaphthylene							
Acenaphthene							
Fluorene							
Phenanthrene							
Anthracene							
Fluoranthene							
Pyrene							
Benzo(a)anthracene							
Chrysene							
Benzo(b)fluoranthene							
Benzo(k)fluoranthene							
Benzo(a)pyrene							
Benzo(ghi)Perylene							
Dibenzo(ah)anthracene							
Ideno(123-cd)pyrene							

Form 7. RETENTION TIME WINDOWS AND CALIBRATION VERIFICATION

Laboratory: _____ Method: _____

Compound	Initial Calibration Data Date of Analysis_____ Internal/External Procedure_____		Daily Calibration Verification Date_____		
	Retention Time Window	Average Calibration Factor	Retention Time	Calibration Factor	Percent Difference
Naphthalene					
Acenaphthylene					
Fluorene					
Phenanthrene					
Anthracene					
Fluoranthene					
Pyrene					
Benzo(a)anthracene					
Chyrsene					
Benzo(b)fluoranthene					
Benzo(k)fluoranthene					
Benzo(a)pyrene					
Benzo(ghi)perylene					
Dibenzo(ah)anthracene					
Indo(123-cd)pyrene					

QUALITY CONTROL/QUALITY ASSURANCE REQUIREMENTS FOR GAS CHROMATOGRAPHY/ MASS SPECTROMETRY ANALYSIS OF PRINCIPAL HAZARDOUS CONSTITUENTS IN GROUND WATER BY SW-846, METHOD 8270

I. Required Instrument Quality Control
   A. Tuning
   B. Initial calibration of GC/MS
   c. Daily calibration

II. Initial Demonstration of Precision and Accuracy

III. On-Going Analysis of Reagent Blank, Matrix Spike, and Matrix Spike Duplicate

IV. Acceptable Accuracy and Precision Limits for Surrogates

V. Verification

VI. Method Detection Limits and Practical Quantification Limits

Table 1. Method Detection Limits and Practical Quantification Limits for Principal Hazardous Constituents

Form 1. Organic Analysis Data Sheet
Form 2. GC/MS Tuning and Mass Calibration
Form 3. Initial Calibration Data
Form 4. Daily Calibration Check
Form 5. Initial Demonstration of Accuracy and Precision
Form 6. Method Blank Summary
Form 7. Water Matrix Spike/Matrix Spike Duplicate Recovery

QUALITY CONTROL/QUALITY ASSURANCE REQUIREMENTS FOR GC/MS ANALYSIS OF PRINCIPAL HAZARDOUS CONSTITUENTS

The following describes the minimum Quality Control/Quality Assurance which must be performed and reported by the laboratory as described in SW-846, Method 8270. Attached are Forms 1-7 which when completed comprise a complete analytical report, including sample results (Form 1).

I. Required Instrument Quality Control

A. Tuning

1. The GC/MS system must be capable of producing a mass spectrum of decafluorotriphenylphosphine (DFTPP) which meets all of the criteria of Method 8270, Table 3, when the procedures in 4.1.3 and 7.3.2 of the method are followed.

2. During each working day, prior to analysis of samples, the analyst must demonstrate that the tuning requirements have been met. Results of the tuning are to be reported on Form 2.

B. Initial Calibration of GC/MS

1. Calibration should follow the procedure given in 5.4 and 7.3 of Method 8270.

2. Before an initial calibration curve is produced, a system performance check must be make to ensure that minimum average Response Factors (RF) are met. The System Performance Check Compounds (SPCC) for semi-volatiles are N-nitroso-di-n-propylamine, hexachlorocyclopentadiene, 2,4-dinitrophenol, and 4-nitrophenol. The minimum acceptable RF for any of these compounds in 0.050.

3. Calculate the response factors for each analyte in the calibration standard as described in 7.3.3 of Method 8270.

4. Calculate the average RF and the percent relative standard deviation (%RSD) for each compound as described in 7.3.4 of Method 8370. The %RSD should be less than 30% for each compound. Record on Form 3.

5. The relative retention times of each compound in the calibration run should be calculated and recorded. See Sections 5.2 and 7.3.2 of Method 8270 for the use of appopriate internal standards. The RRT of each compound in each calibration should agree within 0.06 relative retention units. Record the average RRT for each analyte on Form 3.

6. Using Form 3, report the above calibration information for the curve used when the sample analyses was performed.

C. Daily Calibration

1. Once every daily working period, a SPCC standard must be run to establish that minimum RFs are met.

2. A Calibration Check Compound (CCC) standard at mid-level concentration containing all of the compounds, including surrogates, must be run on a daily basis.

3. If the %Difference, as defined in 7.4.4, for each CCC is less than or equal to 30%, then the initial calibration is assumed to be valid, and analysis of samples may begin.

4. If the % Difference for any CCC if > 30%. then corrective action must be taken. If the problem cannot be isolated and solved, then a new five-point calibration curve must be generated before sample analysis begins.

5. Internal standard (5.2) responses and retention times in the calibration check standard must be evaluated immediately.

6. Record daily calibration check information on Form 4.

II. Initial Demonstration of Precision and Accuracy

On a one-time basis, the analyist must demonstrate the ability to generate

acceptable accuracy and precision by following this procedure:

A. Prepare and analyze a Quality Control Check (QCC) sample following the instructions in Sections 8.5.1-8.5.3 of Method 8270.

B. Calculate the average percent recovery ($\bar{x}$) in ug/L and standard deviation (s) for each analyte.

C. Compare $\bar{x}$ and s with corresponding acceptance criteria for presision and accuracy with those in Table 6.

D. If all $\bar{x}$s and s meet acceptance criteria, system performance is acceptable, and analysis of actual samples may begin.

E. If one or more analyte fails the test, proceed according to the instructions in 8.5.6 or 8.5.6.2.

F. Report results of the accuracy and precision demonstration on Form 5.

III. On-going analysis of reagent blank, matrix spike and matrix spike duplicate

A. A reagent blank must be run with each set of samples and must be demonstrated to be free of interferences. Report the result of the blank analysis on Form 6.

B. With each analytical batch a matrix spike and a matrix spike duplicate must be prepared following instructions in 8.6 of Method 8270. For laboratories analyzing 1-10 samples per month, at least one matrix spike and matrix spike duplicate must be analyzed per month.

1. Calculate the acceptance criteria for the accuracy and precision of each analyte using the equations in 8.6.3 and Table 7 of Method 8270.

2. If any analyte fails the criteria for accuracy and precision, a quality control check standard containing each analyte that failed the criteria must by analyzed in Section 8.7.

3. If the analyte still fails the acuracy and preicision criteria, the analytical result for that analyte in the unspiked sample is suspect, and may not be reported for regulatory purposes.

4. After five spiked samples of the same matrix have been analyzed, calculate percent recovery (p) and standard deviation(sp). Accuracy assessment for that matrix may then be expressed and precision assessment for each analyte on a regular basis.

5. Report the results of the matrix spike and matrix spike duplicate on Form 7.

IV. Acceptable Accuracy and Precision Limits for Surrogates

A. Surrogate spiking solution must be added to each sample following instructions in 5.5. Calculate the percent recovery of each surrogate sample by sample.

B. When a minimun of 30 samples of the same matrix have been analyzed, calculate the average percent recovery (p) and standard deviation (s) for each surrogate.

C. Calculate upper and lower control limits, for a given matrix:

UCL=p+3s
LCL=p-3s

D. If a surrogate in a sample is not within limits, the analyst has four options:

1. Check for errors
2. Reanalyze extract
3. Reextract and reanalyze sample
4. Flag data as "estimated concentration"

E. Report surrogate recovery with the sample results on Form 1.

V. Verification

In order to verify a compound indentification in a sample, two criteria must be met:

A. Relative Retention Time (RRT)

RRT of the compound in the sample must compare to the average RRT of the calibration standards by ± 0.06 RRT units.

B. Mass Spectrum

1. The sample component must correspond to the standard component mass spectrum.
2. Within the same daily working period that the sample analysis is performed, a mass spectrum for the standard reference material must be obtained on the user's GC/MS. Calibration standards' mass spectrum may be used for this.
3. All ions present in the standard mass spectrum at relative intensities of more than 10% must be present in the sample spectrum.
4. Relative ion intensities must agree within ±20%.

C. Verification by RRT must be reported on Form 1 with sample results. Verification by mass spectrum must be presented by including the mass spectrum of the sample component and standard or by tabulation of matching ions.

D. Identification of compounds not in calibration standards

1. The user's computer library of mass spectra may be used to identify compounds not present in the calibration standards.

a. Ions present at greater than 10% must be present in sample spectrum.

b. Relative intensities of ions greater than 10 % must agree within ±20%.

c. Molecular ions present in the reference spectrum should be present in the sample spectrum.

2. An estimate of concentrations of non-calibration compounds can be done using the procedure in 7.6.2.3.

3. Tentative identification and an estimate of their concentration of all non-calibrated compounds must be reported on Form 1, sample results.

VI. Method Detection Limits and Practical Quantification Limits

Method Detection Limits (MDLs) and Practical Quantification Limits (PQLs) are listed in Table 1. All identified compounds detected at a level of 10 ug/L must be quantified. Compounds detected at levels between the MDL and the PQL must be reported but quantification in this range is at the discretion of the laboratory. For those compounds below the PQLs listed in Table 1, that the laboratory does not quantify, the term "detected, but not quantified" should be reported in the concentration column of Form 1.

METHOD DETECTION LIMITS AND PRACTICAL QUANTIFICATION LIMITS FOR PRINCIPAL HAZARDOUS CONSTITUENTS BY GC/MS (ug/L)

Compound	MDLs by EPA Method 625	PQLs by 8270
Naphthalene	1.6	10
Acenaphthylene	3.5	10
Acenaphthene	1.9	10
Fluorene	1.9	10
Phenanthrene	5.4	10
Anthracene	1.9	10
Fluoranthene	2.2	10
Pyrene	1.9	10
Benzo(a)anthracene	7.8	10
Chrysene	2.5	10
Benzo(b)fluoranthene	4.8	10
Benzo(k)fluoranthene	2.5	10
Benzo(a)pyrene	2.5	10
Benzo(ghi)perylene	4.1	10
Dibenzo(ah)anthracene	2.5	10
Indeno(123-cd)pyrene	3.7	10

Form 1. ORGANIC ANALYSIS DATA SHEET

Sample No.
_____

Laboratory Name: _____
Lab Sample ID No: _____
Sample Matrix: _____
Date Extracted: _____
Date Analyzed: _____
Conc/Dilution Factor: _____

Date Sample Collected: _____
Date Sample Received: _____
Date Reported From Lab: _____
Extraction Method: _____
Analytical Method: _____

Compound	Retention Time	Concentration	Units
Naphthalene			
Acenaphthylene			
Acenaphthene			
Fluorene			
Phenanthrene			
Anthracene			
Fluoranthene			
Pyrene			
Benzo(a)anthracene			
Chrysene			
Benzo(b)fluoranthene			
Benzo(k)fluoranthene			
Benzo(a)pyrene			
Benzo(ghi)perylene			
Dibenzo(ah)anthracene			
Indeno(1,2,3-cd)pyrene			

Form 1a. ORGANIC ANALYSIS DATA SHEET CONTINUED

Sample No.
_____

Noncalibration Compounds Detected	Estimated Concentration

Surrogate Recovery

Surrogate Compound	% Recovery	QC Limits Lower Control Limit	QC Limits Upper Control Limit

Form 2. GC/MS TUNING AND MASS CALIBRATION III.LT.14 CONT'D.
DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Laboratory Name _____

Instrument ID _____ Date _____ Time _____

Data Release Authorized by: _____

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	
68	less tan 2.0% of mass 69	[ ][1]
69	mass 69 relative abundance	
70	less than 2.0% of mass 69	[ ][1]
127	40.0 - 60.0% of mass 198	
197	less than 1.0% of mass 198	
198	base peak, 100% relative abundance	
199	5.0 - 9.0% of mass 198	
275	10.0 - 30.0% of mass 198	
365	greater than 1.00% of mass 198	
441	present, but less than mass 443	
442	greater than 40.0% of mass 198	
443	17.0 - 23.0% of mass 442	[ ][2]

THIS PERFORMANCE TUNE APPLIES TO THE FOLLOWING SAMPLES, BLANKS AND STANDARDS.

[1]Value in parenthesis is % mass 69.
[2]Value in parenthesis is % mass 442.

SAMPLE ID	LAB ID	DATE OF ANALYSIS	TIME OF ANALYSIS

Laboratory: _____ Method: _____

Date: _____

Internal or External Standards Calibration Procedure: _____

Nanograms:	RF/RRT	RF/RRT	RF/RRT	RF/RRT	RF/RRT	RF/RRT	RF %RSD	AVE RRT
Compound								
Naphthalene								
Acenaphthylene								
Acenaphthene								
Fluorene								
Phenanthrene								
Anthracene								
Fluoranthene								
Pyrene								
Benzo(a)anthracene								
Chrysene								
Benzo(b)fluoranthene								
Benzo(k)fluoranthene								
Benzo(a)pyrene								
Benzo(ghi)Perylene								
Dibenzo(ah)anthracene								
Indeno(123-cd)pyrene								

System Performance Check Compounds	Response Factors
N-nitroso-di-n-propylamine	_____
hexachlorocyclopentadiene	_____
2,4-Dinitrophenol	_____
4-Nitrophenol	_____

Form 4. DAILY CALIBRATION CHECK

Laboratory _____ Method _____
Date of Initial Calibration _____
Date of Daily Check _____

System Performance Check Compounds | Response Factors

N-nitroso-di-n-propylamine _____
hexachlorocyclopentadiene _____
2,4-Dinitrophenol _____
4-Nitrophenol _____

	Initial Calibration		Daily Calibration Check		Response Factor % Difference
	RRT Window	Average Response Factor	RRT	Response Factor	
Naphthalene					
Acenaphthylene					
Fluorene					
Phenanthrene					
Anthracene					
Fluoranthene					
Pyrene					
Benzo(a)anthracene					
Chrysene					
Benzo(b)fluoranthene					
Benzo(k)fluoranthene					
Benzo(a)pyrene					
Benzo(g,h,i)perylene					
Dibenzo(a,h)anthracene					
Indeno(1,2,3-cd)pyrene					

Daily Calibration Check for Samples: _____

Form 5. INITIAL DEMONSTRATION OF ACCURACY, AND PRECISION,

Date Initial Demonstration Performed: _____

Laboratory: _____ Method: _____

Compound	$\bar{x}$	QC Limits	s	QC Limits	QC Limits
Naphthalene					
Acenaphthylene					
Acenaphthene					
Fluorene					
Phenanthrene					
Anthracene					
Fluoranthene					
Pyrene					
Benzo(a)anthracene					
Chrysene					
Benzo(b)fluoranthene					
Benzo(k)fluoranthene					
Bezo(a)pyrene					
Benzo(g,h,i)Perylene					
Dibenzo(a,h)anthracene					
Indeno(1,2,3-cd)pyrene					

Form 6. METHOD BLANK SUMMARY

Laboratory: _____ Date: _____

Method: _____

Compounds	Concentration (µg/L)
Naphthalene	
Acenaphthylene	
Acenaphthene	
Fluorene	
Phenanthrene	
Anthracene	
Fluoranthene	
Pyrene	
Benzo(a)anthracene	
Chrysene	
Benzo(b)fluoranthene	
Benzo(k)fluoranthene	
Benzo(a)pyrene	
Benzo(ghi)Perylene	
Dibenzo(ah)anthracene	
Indeno(1,2,3-cd)pyrene	

Method Blank Summary for Samples: _____

Form 7. WATER MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Sample # _____ Laboratory Name: _____ Method: _____

Date: _____ For Samples: _____

Compound	Conc. Spike Added(ug/L)	Sample Result(ug/L)	Concentration Matrix Spike	% Recovery	Concentration Matrix Spike Duplicate	% Recovery	RPD	QC Limits RPD	QC Limits % Recovery
Naphthalene									
Acenaphthylene									
Acenaphthene									
Fluorene									
Phenanthrene									
Anthracene									
Fluoranthene									
Pyrene									
Benzo(a)anthracene									
Chrysene									
Benzo(b)fluoranthene									
Benzo(k)fluoranthene									
Benzo(a)pyrene									
Benzo(ghi)Perylene									
Dibenzo(ah)anthracene									
Indeno(123-cd)pyrene									

QUALITY CONTROL/QUALITY ASSURANCE REQUIREMENTS FOR ANALYSIS OF VOLATILE AROMATICS USING SW-846 METHODS 5030 (PURGE AND TRAP) AND 8020 (VOLATILE AROMATICS USING GAS CHROMATOGRAPHY/PID)

The following describes the minimun Quality Control/Quality Assurance which must be performed and reported by the laboratory as described in SW-846. Method 8270, Aromatic Volatile Organics, is the determinative method. Method 5030, Purge and Trap, is the sample preparation and sample introduction method. Attached are Forms 1-6 which when completed comprise a complete analytical report.

I. Required Instrument Quality Control

A. Initial calibration

1. Calibration should follow the procedure given in Section 5.2-5.6 and 7.3 in Method 8020 and 7.4 in Method 8000.

2. Calculate the response factors for each analyte in the calibration standard as described in Sections 7.4.2.3 or 7.4.3.3 in Method 8000.

3. The relative retention times (RRT) of each compound in the calibration standard should be calculated and recorded. Calculate the average RRT times and the standard deviation of the RRT. Plus or minus three times standard deviation of the RRT is generally used as the RRT window.

4. Record the response Response Factors and the RRT for the initial calibration on Form 2.

B. Daily Calibration

1. On a daily basis the analyst must check the working calibration curve or calibration factor by analyzing one or calibration standards. If any analyte varies by more than plus or minus 15 percent from the response predicted by the initial calibration, then the intial calibration must be redone. The relative retention times of each analyte must also fall within the windows established during the initial calibration.

2. Record the information from the daily calibration check on Form 3.

II. Initial Demonstration of Precision and Accuracy

On a one-time basis, the analyist must demonstrate the ability to generate the ability to generate acceptable accuracy and precision by the following procedure:

A. Prepare and analyze a Quality Control Check sample following sections 8.6.1-8.6.3 in Method 8000.

B. Calculate the average recovery in ug/L and the standard deviation in ug/L for each analyte of interest.

C. For each analyte, compare the average recovery and the standard deviation for each analyte with the corresponding acceptance criteria in Table 3. Calibration and QC Acceptance Criteria in Method 8020. System performance is considered acceptable, and sample anaylses may began, when the acceptance critiria for analytes are met. If any individual precision or accuracy criteria is not met, then system performance is not acceptable for that anaylte.

D. When one of the analytes fails to meet the accuracy or presision criteria, the analyst must do one of the following:

1. Locate and correct the source of the problem and repeat the precision and accuracy demonstration for all analytes beginning with Section 8.6.2 of Method 8000, or

2. Repeat the demonstration only for those analytes that failed the test beginning with Section 8.6.2 of Method 8000.

3. Report the results of the accuracy and precision demonstraion on Form 4.

III. On-going analysis of reagent blank, matrix spike and matrix spike duplicate

A. A reagent blank must be run with each set of samples and must be demonstrated to be free of interferences. Report the results of the blank anaylsis on Form 5.

B. With each analytical batch, not to exceed 20 samples, a matrix spike and a matrix spike duplicate must be prepared and analyzed following the directions in 8.7 of Method 8000.

1. Calculate the acceptance criteria for the accuracy and precision of each analyte using Table 3 or 4 in Method

8020.

2. If any analyte fails the criteria for precision or accuracy, a quality control check standard containing each analyte that failed the criteria must be analyzed as given in Section 8.8 of Method 8000.

3. If the analtye still fails the accuracy and/or presision criteria, the analytical result for that analyte in the unspiked sample is suspect and may not be reported for regulatory purposes.

4. Report the results of the matrix spike and matrix spike duplicate on Form 6.

IV. Acceptable Accuracy and Precision Limits for Surrogates

A. Surrogate spiking solution must be added to each sample following the instructions in Section 5.6 of Method 8020.

B. Calculate the percent recovery (p) and standard deviation (s) of each surrogate. For a given sample matrix, calculate the upper and lower control limits for percent recovery by:

Upper Control Limit(UCL)=p+3s

Lower Control Limit (LCL)=p-3s

C. If the recovery of a surrogate is not within limits, the analyst must:

1. Check to be sure that there are no errors in calculations, surrogate standards, or calibration standards. Check instrument performance.

2. Recalculate data and/or reanalyze extract if any of the above checks reveals a problem.

3. If none of the above are a problem, the sample must be either reextracted and reanalyzed, or the data must be flagged as "estimated concentration."

4. Report surrogate recovery with the sample results on Form 1.

VI. Method Detection Limits (MDLs) and Practical Quantification Limits (PQLs)

Method Detection Limits and Pratical Quantification Limits are listed in Table 1.

Form 3. DAILY CALIBRATION CHECK

Laboratory _____ Method _____
Date of Initial Calibration _____
Date of Daily Check _____

	Initial Calibration		Daily Calibration Check		Response Factor % Difference
	RRT Window	Average Response Factor	RRT	Response Factor	
Ethylbenzene					
Toluene					
Xylenes					

Form 4. INITIAL DEMONSTRATION OF ACCURACY, AND PRECISION,

Date Initial Demonstration Performed: _____

Laboratory: _____ Method: _____

Compound	x	QC Limits	s	QC Limits	QC Limits
Ethylbenzene					
Toluene					
Xylenes					

Form 1. ORGANIC ANALYSIS DATA SHEET

Sample No.
_____

Laboratory Name: _____
Lab Sample ID No: _____
Sample Matrix: _____
Date Extracted: _____
Date Analyzed: _____
Conc/Dilution Factor: _____

Date Sample Collected: _____
Date Sample Received: _____
Date Reported From Lab: _____
Extraction Method: _____
Analytical Method: _____

Compound	Retention Time	Concentration	Units
Ethylbenzene			
Toluene			
Xylenes			

Form 2. Initial Calibration Data

Laboratory: _____ Method: _____

Date: _____

Internal or External Standards Calibration Procedure: _____

Nanograms:	RF	RRT	RF	RRT	RF	RRT	TF	RRT	RF	RRT	RF	RRT	RF %RSD	Ave RRT
Compound														
Ethylbenzene														
Toluene														
Xylenes														

Form 5. METHOD BLANK SUMMARY

Laboratory: _____ Date: _____

Method: _____

Compounds	Concentration (µg/L)
Ethylbenzene	
Toluene	
Xylenes	

Form 6. WATER MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Sample # _____ Laboratory Name: _____ Method: _____

Date: _____ For Samples: _____

Compound	Conc. Spike Added(ug/L)	Sample Result(ug/L)	Concentration Matrix Spike	% Recovery	Concentration Matrix Spike Duplicate	% Recovery	RPD	QC Limits RPD	% Recovery
Ethylbenzene									
Toluene									
Xylenes									

7.0 WASTE ANALYSIS PLAN

The Waste Analysis Plan describes the procedures to be used to determine the physical and chemical characteristics of representative samples of waste to be treated at the Paradise land treatment facility. This plan is designed to comply with 40 CFR 270.14(b)(3) and 40 CFR 264.13. This plan includes identification of the wastes to be sampled, analytical parameters and the rationale for choosing these parameters, sampling procedures, analytical methods including quality assurance/quality control procedures, and the frequency of sampling used to characterize the waste prior to land treatment.

7.1 Waste identification

The wastes that will be land treated at the Paradise facility consist of creosote sludge and creosote contaminated soils from the Paradise and Somers tie treating plants. The creosote sludges and contaminated soils contain seven to 35 percent moisture by weight, 45 to 80 percent inert materials by weight, and two to 20 percent organics by weight.

Complete analyses of the Paradise and Somers wastes have been conducted on numerous occasions since the spring of 1984 and included such parameters as base/neutral and acid extractables, metals, PCBs, cyanide, phenolics, and volatile organics. Sections 6 and 22.2 provide a more detailed review of the physical and chemical characteristics of the waste.

7.2 Sampling Plan

Samples will be collected twice a day during the application of wastes to the land treatment facility. The samples will be analyzed in a mobile laboratory which will be set up at the Paradise site for the duration of each application. The labora-

tory will be equipped with a high performance liquid chromatograph (HPLC) as well as other support equipment.

7.2.1 Sampling Procedures

Grab samples will be collected from the waste pile or from transportation trucks using a stainless steel hand trowel. Three to five grabs will be obtained, composited in a stainless steel bucket and transferred to a clean one-quart glass jar. Waste pile samples will be collected from the area of the waste pile where the current removal of waste for immediate transfer to the land treatment facility is being conducted. Samples collected from transportation trucks will be obtained from the truck bed upon their arrival at the facility.

Each sample will be labeled and the appropriate information recorded, including the date, time, sample matrix description, sampler's name, along with the approximate location where the sample was taken in the waste pile and/or the truck. Each sample will be packed in ice in a cooler or deposited immediately in the mobile laboratory refrigerator. All sampling equipment will be decontaminated according to standard operating procedures (SOP 120, Appendix O) between sampling points.

7.2.2 Analytical Parameters

The samples will be analyzed for polynuclear aromatic hydrocarbons (PAH) and benzene extractables. These parameters were selected because they use analyses that can be conducted in a mobile laboratory with reasonably quick results and the results will allow the Facility Supervisor to control the land treatment loading rates. The PAH analysis will be completed on a one sample per day basis whereas the benzene extractables analysis will be completed on a two sample per day basis.

7.2.3 Quality Control Samples

Replicate waste samples will be analyzed at least once per every 10 samples or approximately once per week during waste application periods. These samples will not be identified as replicates but will be given a unique identification.

7.2.4 Chain of Custody

Samples will be maintained under chain of custody. All samples will be placed in the mobile analytical laboratory as soon as possible after recovery and put into the custody of the laboratory chemist. Upon receipt at the laboratory, the samples will be logged into the laboratory logbook and given an unique identification number. All samples will be inspected for damage and leakage upon receipt.

7.3 Laboratory Procedures

The procedures for determination of PAH concentrations in waste/soil mixtures involve sonication extraction, extraction clean-up, and identification of PAH compounds in the extract using high performance liquid chromatography (HPLC). All procedures will be in accordance with EPA standard methods. Benzene extractables will be determined by using a modification of EPA Method 413.1. The procedures, methods and objectives of each analytical step are outlined in Table 7-1.

7.3.1 Extraction

Sonication extraction Method 3550 (U.S. EPA 1982) will be used. Waste/soil mixtures will be dispersed into 30 ml methylene chloride using sonication for 15 minutes. After decanting the solvent, the procedure will repeated twice using additional 30 ml portions of methylene chloride to achieve a total sonication time of 45 minutes. The methylene chloride extracts will be combined

TABLE 7-1

WASTE ANALYSIS PROCEDURES

Procedure/Analysis	Method*	Objective
Sonication extraction	3550	extract PAH and other compounds from the soil matrix
Extraction clean-up	3530	separate and isolate PAH compounds
PAH	8310	chemical identification of individual PAH compounds
QA/QC	8310	analysis verification and quantification
Benzene Extractables	413.1+	gross measure of solvent extractable materials in soil

* U.S. EPA. 1982.

\+ Modified Method 413.1, Using Benzene as the Extraction Solvent. U.S. EPA. 1979.

and dried over anhydrous sodium sulfate.

The clean-up procedure to be used to separate PAH compounds from other classes present in the original extract of the waste/soil mixture is based on EPA Method 3530. This procedure involves extraction of the original methylene chloride extract with an aqueous base to partition phenols and other organic acids. Using an alumina column, the remaining base/neutral (B/N) fraction is separated into B/N aliphatics with pentane, PAH compounds with methylene chloride, and B/N polar organics with methanol.

Benzene extractables will be analyzed for using a modification of Method 413.1 (U.S. EPA 1979) with substitution of benzene for freon as the extraction solvent. All other procedures remain identical to those in Method 413.1.

7.3.2 Chemical Analysis

PAH compounds will be identified and quantified using high performance liquid chromatography (HPLC), Method 8310 (U.S. EPA, 1982). Identification of PAH compounds is based on matching retention times for chromatographic peaks obtained for extracts of waste/soil mixtures with retention times obtained using analytical standards. Quantification of PAH compounds is based on peak area integration.

Benzene extractable content will be determined gravimetrically according to EPA Method 413.1. Using this procedure, the compounds are extracted by direct contact with benzene. The solvent is separated from the solid phase, dried, and evaporated to determine the extractable residue by gravimetric technique.

7.3.3 Quality Assurance/Quality Control Procedures

Quality assurance/quality control (QA/QC) procedures identified in Method 8310 (US EPA, 1982) and additional QA/QC procedures used for identification of PAH compounds are discussed

in Appendix I. The QA/QC program describes the calibration of all analytical apparatus and the use of control samples and replicate analyses.

37.4 Soil-Pore Water Monitoring

37.4.1 Sampling Location and Depths

As part of the unsaturated monitoring program for the Paradise land treatment facility, soil-pore water monitoring will be conducted quarterly in order to track hazardous constituents that may migrate below the treatment zone. Pressure-vacuum lysimeters will be used as the sampling devices. Based on results of the LTD, the commercially available pressure-vacuum lysimeters were the only devices that collected soil-pore water (the trench and glass block lysimeters did not collect any appreciable water) during the two year LTD study.

Background lysimeters will be installed in soils representative of the active treatment zone. A total of 16 lysimeters (two per four active acres and two background) will be installed at the facility. Lysimeter locations will be selected for all 16 lysimeters using the random number table and selection procedure outlined in Section 37.3. All lysimeters will be installed below the treatment zone at a depth of approximately 5.5 feet from ground surface.

37.4.2 Installation Procedures

All lysimeters will be installed according to the procedures outlined in the Guidance Manual on Unsaturated Zone Monitoring for Hazardous Waste Land Treatment Units (EPA/530-SW-86-040, 1986). All lysimeters will be installed into a non-disturbed pit wall from a trench excavation. The sampling lines will be run along a excavation line (approximately 15-30 ft) to an access point out of the active operation. The trench will be constructed to a depth below the depth of the soil tilling equipment.

Installation of the Paradise lysimeters will be performed by the following procedures:

1) The lysimeters will be cleaned with deionized water and methanol and set in a bucket of deionized water.

2) The appropriate amount of sampling and access lines will be inserted into the instruments and marked accordingly.

3) Using a hand auger, a borehole will be augered into the pit wall of the trench so that the bottom of the borehole is at the 5.5 ft. depth.

4) Pour in bentonite through a piece of conduit (i.e. tremie it in) so that the bentonite is placed at the bottom of the hole. Add water.

5) Pour in silica flour, insert the sampler, and pore additional flour into the hole to cover the sampler above the ceramic cap.

6) Backfill native soil above the flour. The subsurface soils at Paradise may have gravel and will require screening prior to backfilling around the lysimeter. Place a layer of bentonite above the screened backfill to isolate the sampler.

7) Finally, backfill the trench to ground surface in one foot lifts, tamping the soil of each lift. Before placing the backfill, a layer of bentonite powder should be placed at the bottom of the total trench excavation to add bulk density to the backfilled soils and inhibit short-circuiting of contamination migration.

37.4.3 Sampling Procedures

The procedures for retrieving a soil pore-liquid sample involves evacuating the lysimeter of soil pore-liquid by pumping it out, applying a suction to the lysimeter, leaving the suction on for a period of time (24 hours or more) to draw soil pore-liquid into the lysimeter, and then pumping the sample out of the lysimeter.

After evacuating the lysimeter of static pore water by pumping it out, the suction is applied to the lysimeter by attaching the suction hose to a hand pump. This line is attached to the inlet of the pump on the same side which has the Bourdon

gauge. The other hose, the sampling hose (pressure side) should be sealed with the ring clamp while suction is being applied. The suction is applied by pumping the pump until the Bourdon gauge reads approximately 80 centibars. The end of the suction hose is then folded over, and the "ring clamp" attached in a manner which will prevent the suction from being released. The suction hose is then removed from the pump and the sampler is activated.

The time required to collect a sample depends on the soil and the available moisture. Tensiometers will be installed to measure the soil suction in the soil during the course of the warm weather months. If the soil suction is between zero to 60 centibars at the time of sampling, a sample can be attempted by leaving the suction on for 24 hours. With a soil suction of 60 to 80 centibars, it will be necessary to leave the suction on for three to five days before attempting a sample. If the soil suction is above 80 centibars, the soil is too dry for a soil pore-liquid sample to be retrieved, and the sampling event will be rescheduled.

To retrieve the sample, the pressure/vacuum hose is attached to the hand pump inlet which does <u>not</u> have the Bourdon gauge attached to it. The end of the sample hose is placed in the sample bottle. The hand pump is <u>gently</u> pumped, creating just enough pressure to push the sample out of the lysimeter to the sample bottle(s). It is very important not to pump too hard or fast because too much pressure can cause the ceramic tip of the lysimeter to break. After the sample is retrieved, the ring clamps should be placed back on both hoses.

When collecting each sample, the Bourdon gauge should be reattached to the suction line and the vacuum of the system noted in a field log just prior to sampling and at the time the suction was applied. In addition, the volume of sample should be quantified and noted. A record of weather and surface conditions kept through out the study will be helpful in interpreting the pore-liquid data. These will be recorded during each sampling

event on the sample collection sheets.

Soil pore-liquid samples will not be composited with each lysimeter sample being analyzed individually. Lysimeter samples will be analyzed by GC/MS Method 8270 Base Neutral fraction only.

37.5 Sample Preservation, Shipping Procedures, and Analytical Methods

Soil core samples and soil pore water samples will be preserved for analysis by refrigeration at 4°C. All samples will be collected in glass containers with teflon lined lids. Chain of Custody control will be maintained for all samples. All samples will be placed in labeled jars, placed in coolers and iced, and shipped to the laboratory by overnight carrier.

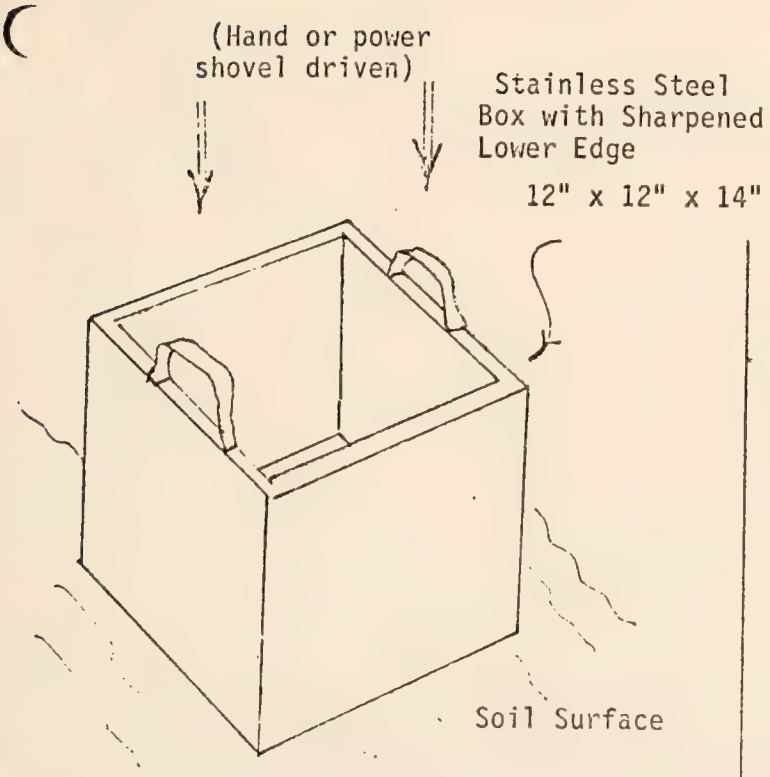
Soil core samples will be analyzed for polynuclear aromatic hydrocarbons (PAH's) by Method 8310 using High Performance Liquid Chromatography (HPLC). Soil pore water samples will be analyzed for base neutral fraction organics by Method 8270 using Gas Chromatography/Mass Spectrophotometry (GC/MS). Laboratory QA/QC will be consistent with the procedures used during the land treatment demonstration and outlined in Appendix I.

37.6 Analysis and Evaluation of Monitoring Data

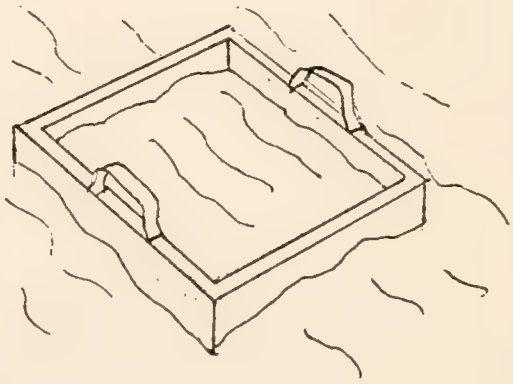
Statistical analysis of the unsaturated zone monitoring program soil core and lysimeter data will be conducted using the tolerance interval test outlined in Appendix Q and proposed for the Waste Pile and Landfarm Groundwater Monitoring Programs.

1) If a hazardous constituent is detected in a ground-water sample that exhibited no detectable concentration in background sampling events prior to land treatment operation, a statistically significant increase for that constituent shall be any value greater than the practical quantitation limit for that compound as specified in EPA SW-846 Method 8270 for the lysimeter analyses and the PQL for soils using HPLC Method 8310.
2) If a hazardous constituent is detected in a lysimeter or

POSSIBLE MODIFIED SOIL SAMPLING PROCEDURE TO MINIMIZE LOWER ZONE CONTAMINATION FROM SURFACE

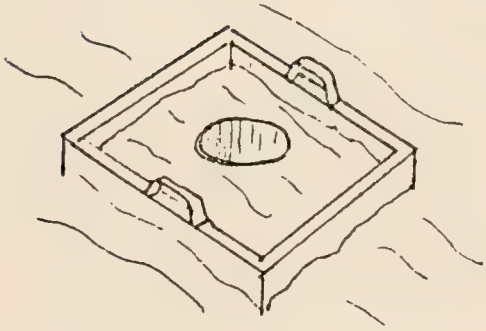


General Configuration



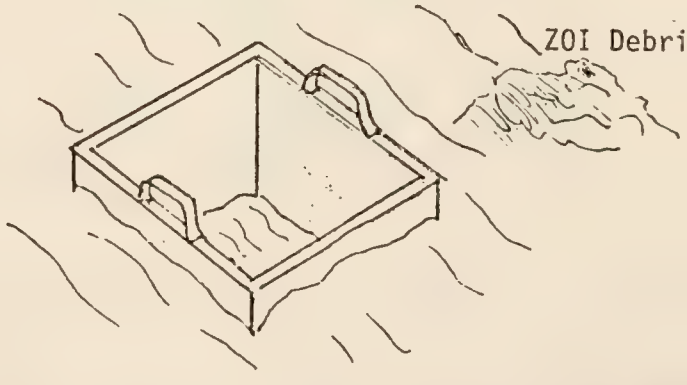
Sample Box Inserted in Soil to 13"





Extraction of Core (or entire box to 12" ZOI depth)





Removal of ZOI soil debris and Lower Zone Sampling

8 AMENDED STUDENT-t POOLED VARIANCE PROCEDURE

3.8 DATA ANALYSIS AND EVALUATION

A critical step in any monitoring program is the proper analysis and evaluation of the data collected. Input from the field scientist is important in this data interpretation. The field scientist should have made observations of field conditions (e.g., weather, unusual waste distribution patterns, soil conditions, etc.) when the samples were taken and noted these in the field log book (see Appendix B). This information will assist in explaining the sampling data and provide insight into potential remedial actions that may be taken in the event they are necessary.

Appendix C provides example sheets for summarizing the analytical and statistical analysis results from unsaturated zone monitoring. Summary sheets, such as these, and the chain of custody documentation described in Appendix B, should be included in the operating record of the facility.

The land treatment regulations (see 40 CFR Part 264) require that the owner or operator determine if hazardous constituents have migrated below the treatment zone at levels that are statistically increased over background levels. The following analysis can be used to make this determination. This analysis can be done on a calculator.

The mean (Eq. 3-1), variance (Eq. 3-2), and a two-sided (100(1-α)%) confidence interval (Eq. 3-3) are first calculated by the following equations:

$$\bar{y} = \sum_{i=1}^{n} y_i/n \qquad (3\text{-}1)$$

$$s^2 = \sum_{i=1}^{n} (y_i - \bar{y})^2/(n-1) \qquad (3-2)$$

where y_i = ith sample

n = number of samples

$\bar{y}$ = sample mean

s^2 = estimated variance of the mean

$$L = \bar{y} \pm t_{\alpha/2} \frac{s}{\sqrt{n}} \qquad (3-3)$$

where L = 100 (1 - α) % confidence level

$t_{\alpha/2}$ = the $\alpha/2$ percentage value from a one-sided t-distribution with (n - 1) degrees of freedom

s = standard deviation

The data for each hazardous constituent or "principal hazardous constituent" (if identified in permit) from the background area can be statistically compared to the data from the appropriate uniform area in the active portion using the Student's t-test. The t-test given in equation 3-4 below (Li, 1969) is used to determine if the mean of the hazardous constituents in the uniform area is greater than that in the appropriate background area. This equation assumes homogeneity of variances which is most often the case in soils work.

For testing, if the uniform area (active portion) mean is greater then the background mean (i.e., one-tailed test), compare the calculated t-value (t_c) with the critical value t_α, where t_α is the upper tail value from the tabular t-distribution with $n_1 + n_2 - 2$ degrees of freedom at the α significance level. If $t_c > t_\alpha$, there is a statistically significant increase in the uniform area (active portion) mean over the background area mean.

$$t_c = (\bar{y}_1 - \bar{y}_2) \Big/ \sqrt{s_p^2 (1/n_1 + 1/n_2)} \qquad (3-4)$$

where t_c = calculated t-value

$\bar{y}_k$ = mean for area k

k = 1 for uniform area (active portion)

k = 2 for background area

s^2_p = pooled variance calculated by formula Eq. 3-5

n_k = number of samples in area k

$$s^2_p = \frac{\sum_{i=1}^{n_1} (y_i - \bar{y}_1)^2 + \sum_{j=1}^{n_2} (y_j - \bar{y}_2)^2}{n_1 + n_2 - 2} \qquad (3\text{-}5)$$

A simple way to calculate the estimated pooled variance, s^2_p, is as foll
for control (1) and treatment samples (2) in area k:

$$s_p^2 = \frac{(n_1 - 1) \cdot s_1^2 + (n_2 - 1) \cdot s_2^2}{n_1 + n_2 - 2}$$

The computational formula for individual k variances is:

$$s_k^2 = \frac{\sum_{i=1}^{n_k} y_i^2 - (\sum_{i=1}^{n_k} y_i)^2 / n_k}{n_k - 1}$$

PAHS USED IN CLOSURE PERFORMANCE STANDARD

naphthalene
acenaphthalene
acenaphthene
fluorene
phenanthrene
anthracene
fluoranthene
pyrene
benzo(a)anthracene*
chrysene*
benzo(b)fluoranthene*
benzo(k)fluoranthene*
benzo(a)pyrene*
dibenzo(a,h)anthracene*
benzo(g,h,i)perylene*
indeno(1,2,3-cd)pyrene*

*carcinogenic PAH

Excerpted From:

Permit Guidance Manual on Hazardous Waste
Land Treatment Demonstrations, U.S. EPA, July 1986

5.4.1.1 Microtox™--

The Microtox™ system is a simple standardized toxicity test system which utilizes a suspension of marine luminescent bacteria (Photobacterium phosphoreum) as bioassay organisms. The system measures acute toxicity in aqueous samples. An instrumental approach is used in which bioassay organisms are handled much like chemical reagents. Suspensions with approximately 1,000,000 bioluminescent organisms in each are "challenged" by addition of serial dilutions of an aqueous sample. A temperature controlled photometric device quantitatively measures the light output in each suspension before and after addition of the sample. A reduction of light output reflects physiological inhibition, thereby indicating the presence of toxic constituents in the sample.

For purposes of the LTD, acute toxicity tests are conducted using the water soluble fraction (WSF) extracted from appropriate samples of waste, soil and/or a series of waste-soil mixtures. An EC50 (effective concentration causing a 50 percent decrease in bacterial bioluminescence) is calculated for each WSF extracted. Results are used to calculate the range of loading rates around a "toxic floor" which will not produce an unfavorable impact on the soil microbial detoxification potential.

The Microtox™ System (Microbics Corporation, Carlsbad, CA) described in this chapter has been evaluated using a large number of pure compounds and complex industrial wastewaters and sludges. This procedure, as with any other toxicity screening test which might be used, offers potential advantages and disadvantages.

The small volume of sample required (as little as 10 ml) and the rapidity in which results can be obtained (less than one hour for the assay itself) are highly desirable features of a screening procedure. It is also reported effective in determining relative acute toxicity of complex effluents containing toxic organic constituents (Qureshi et al. 1982, Vasseur et al. 1984, Burks et al. 1982; Casseri et al. 1983; and Indorato et al. 1984). In each of these studies, Microtox™ results were compared with those from several other assays and were found to provide a reliable indication of the presence of toxic organics. Both Qureshi et al. and Vasseur et al. reported Microtox™ to be more sensitive to complex organic effluents than the other assays tested. King (1984) reported that the production of light by the luminescent bacteria in the Microtox™ reagent is very sensitive to the presence of inhibitory chemicals.

Strosher (1984) reported the assay to be a viable method of screening for apparent toxicity in complex waste drilling fluids. Microtox™ results were found to correlate closely with those from rainbow trout bioassays. Strosher recommended that this assay be utilized as a tool in evaluating effects of drilling fluids on soils. In an earlier paper, Strosher et al. (1980) reported that small changes in concentrations of toxic components could be detected using the Microtox™ procedure. Matthews and Bulich (1985) and Matthews and Hastings (1985) presented results from toxicity screening and toxicity reduction tests conducted using the WSF extracted from different types of waste-soil mixtures.

There are two potential disadvantages to consider. First, the Microtox™ test organism is a photoluminescent bacterium of marine origin, which may not accurately represent the response of soil microbes. In addition, the test procedure is designed to measure the toxicity of water soluble constituents and may underestimate the toxicity of hydrophobic compounds. Reported results from developmental work and evaluation involving different types of waste-soil mixtures tend to discount either disadvantage as a severe hindrance for using the test for general screening purposes (Matthews 1983; Matthews and Bulich 1984; Sims 1985; and Matthews and Hastings 1985). Microtox™ toxicity screening test results have been used by these researchers to establish a range of initial waste application rates that did not result in undesirable impacts on the soil system with respect to treatment potential, thereby allowing detoxification of hazardous organic constituents to occur.

King (1984) reported Microtox™ to be more sensitive to inhibitory chemicals than activated sludge organisms. Slattery (1984) found that when the influent EC50 for Microtox™ became less than 10 percent, activated sludge organisms became completely inactive. The Microtox™ test can be useful for predicting initial waste application rates if a similar relationship exists between the inhibition of Microtox™ bioluminescence and soil microbial activity can be further substantiated.

5.4.1.1.1 Experimental Apparatus--Two major pieces of experimental apparatus are needed to conduct the toxicity screening test procedure as described in this section. A tumbler, wrist-action or platform shaker is used to extract the WSF from each sample. Following extraction, the Microtox™ system is used to determine the relative residual acute toxicity in each WSF sample.

5.4.1.1.2 Water Soluble Fraction Extraction Procedure--A distilled, deionized water (DDW) extraction procedure as described by Matthews and Hastings (1985) is used to generate WSF samples. The following steps are used to prepare these samples for toxicity testing:

a. Place a 100 g sample of each of the background soil, waste, and selected soil-waste mixtures into an extraction vessel, i.e., 500 ml glass flask or bottle. If the waste has a high water content, a thoroughly mixed sample can be centrifuged to obtain the WSF for toxicity testing, thus eliminating the need for the extraction step.

b. Add 400 ml of DDW (4:1 vol/wt extraction ratio) to each vessel and seal tightly.

c. Use a tumbler shaker for mixing. If a wrist-action shaker is used, place the vessels on the shaker at a 180° angle; if a platform shaker is used, place the vessels on their side. In all cases, the extraction vessels must be sealed tightly.

d. Allow the extraction vessels to shake for 20 ± 4 hrs at approximately 30 rpm in the tumbler shaker or 60 rpm on the wrist-action or platform shaker.

e. Following the specified mixing period, remove flasks from the shaker and allow them to sit for 30 minutes. Decant the supernatants into high-speed centrifuge tubes. Add 0.4 g of NaCl for each 20 ml of sample; shake; then centrifuge at 2,500 rpm for 10 minutes.

f. Prepare a sample from each test unit for Microtox™ testing by pipetting 20 ml of elutriate from each centrifuge tube into a clean glass container, sealing and storing at 4°C. Take care to ensure that any floating material is not transferred. As soon as all samples are prepared, begin Microtox™ testing; conduct all tests the same day that they are prepared.

g. Follow the test procedure outlined in the Microtox™ System Operation Manual (Beckman Instruments, Inc. 1982).

5.4.1.1.3 Test System Operation--The Microtox™ toxicity analyzer, associated reagents, and detailed operating instructions can be obtained from Microbics Corporation, Carlsbad, CA. The test involves:

(a) Adjusting the instrument to the desired test temperature, i.e., 15°C.

(b) Adding 0.01 ml of rehydrated cell suspension to serial dilutions prepared by mixing the previously extracted WSF samples in appropriate dilution water.

(c) Taking readings of light outputs at time zero and after the desired reaction time, i.e., 5 minutes for most applications.

(d) Using blank readings to correct for time-dependent drift in light output.

(e) Calculating relative acute toxicity (EC50 values along with upper and lower 95 percent confidence limits) for the WSF extract. This involves preparing a log-log plot of concentration versus gamma (the ratio of light loss to light remaining) corrected for effects of lightdrift based on the blank response. The concentration of the sample corresponding to a gamma of 1 is termed the EC50 (t,T), meaning at this concentration a 50 percent decrease in light output occurs for an exposure time (t) and test temperature (T).

17.1 Introduction

Burlington Northern Railroad owns a tie-treating plant in Paradise, Montana, which is no longer in operation. Creosote contaminated soils and sludges originating from this plant, as well as from another Burlington Northern tie-treating plant located in Somers, Montana, have been temporarily stored in a waste pile at Paradise. These wastes, and additional wastes still at Somers, are to be treated at the Paradise land treatment facility. Creosote wastes are "listed" or are a "characteristic" hazardous waste as defined in 40 CFR 261, identified by the U.S. EPA Hazardous Waste Number K001 as wastes that consist of bottom sediment sludge from the treatment of wastewaters from wood preserving processes that use creosote and/or pentachlorophenol. (No pentachlorophenol is present in the wastes to be handled in the land treatment facility).

The EPA and the Montana Department of Health and Environmental Science (MDHES) have closure performance standards and financial requirements (40 CFR 264 Subparts G, H and M and ARM 16.44 Subchapter 8, respectively) applicable to all permitted hazardous waste management facilities (HWMFs). The closure performance standards were developed to ensure that all hazardous waste management facilities are closed in a manner that: (1) minimizes the need for further maintenance, and (2) controls, minimizes ar eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous waste constituents, leachate-contaminated rainfall, or waste decomposition products to groundwater, surface water, or to the atmosphere (40 CFR 264.111). All closure plans must provide certain minimum information (40 CFR 264.112(a)):

1) A description of how and when the facility will be partially closed, if applicable, and ultimately closed, including an estimate of the maximum extent of the

operation which will be open at any point during the life of the facility;

2) An estimate of the maximum inventory of wastes in storage or treatment at any time;

3) A description of steps necessary to decontaminate the facility or render it non-hazardous at closure; and

4) A description of the groundwater monitoring and the run-on and run-off control systems; and

5) A schedule for final closure activities.

Additional requirements for hazardous waste land treatment units that will be addressed in this closure plan according to 40 CFR 264.280 are:

1) To evaluate the extent of degradation and attenuation of constituents within the defined treatment zone; and

2) Control the pathways of migration of hazardous waste and hazardous waste constituents into the environment, including the groundwater, surface water and atmosphere.

The purpose of the closure cost estimation requirement is to determine the amount of financial assurance needed. The closure cost estimate is based on the methods of closure described in the closure plan. It must account for managing the maximum inventory expected as indicated in the closure plan. A cost estimate for a given activity must include all costs (i.e., including fringe benefits and overhead), any costs of supervision, fuel and maintenance costs for the equipment used, administrative costs, and provisions for contingencies. Administrative costs include all costs associated with taxes and insurance, as well as costs of routine administration, paperwork, and reporting.

An owner/operator may amend the closure plan/cost estimate at any time during the life of the facility (40 CFR 264.112(c)). If changes in operating plans or facility design affect the closure plan/cost estimate, then the plan/cost estimate must be amended. The closure cost estimate must also be adjusted annually to account for inflation by using an inflation factor derived from the annual Implicit Price Deflator for Gross

National Product.

The owner or operator must submit his closure plan to the EPA Regional Administrator and/or Montana State Administrator at least 180 days before the date he expects to begin closure. The Administrator will modify, approve, or disapprove the plan within 90 days of receipt and after providing the owner or operator and the affected public (through public notice) the opportunity to submit written comments.

The objective of this chapter is to demonstrate compliance with closure and post-closure activities and cost estimate requirements of RCRA for the proposed Paradise Land Treatment Facility. Table 17-1 provides a cross-reference of the closure and post-closure regulations with the sections of this chapter.

17.2 Closure Performance Standard (40 CFR 264.111)

All the creosote contaminated soils and sludges now stored in the waste pile will be land treated on-site along with additional soils and sludges from the Somers site. The land treatment process will treat the hazardous wastes and hazardous waste constituents and make them non-hazardous or less hazardous through degradation, transformation or immobilization processes occurring in the soil. The land treatment demonstration project conducted at the Paradise site has successfully shown that the creosote waste at Paradise can be land treated and the goals for land treatment as described in 40 CFR 264 Subpart M are attainable.

17.3 Description of Closure and Schedule (40 CFR 264.112 (a)(1))

The land treatment facility will be closed after the final application of contaminated soils and sludges. It is anticipated that the land treatment facility will be operated for four years

TABLE 17-1

CROSS REFERENCE OF REGULATIONS
FOR THE CLOSURE AND POST-CLOSURE PLANS

Regulatory Citation	Description	Permit Application Section
Subpart G		
264.111	Closure Performance Standard	17.2
264.112(a)(1)	Description of Closure and Schedule	17.3
264.112(a)(4)	Closure Schedule Estimate	17.3
264.114	Decontamination Requirements	17.4
264.114	Equipment Decontamination	17.4
264.112(b)(3)	Estimate of Waste Inventory	17.5
264.112(c)	Amendment of Closure Plan	17.6
264.115	Closure Certification	17.7
264.117	Post-Closure Care	17.9
264.118	Post-Closure Plan and Amendment	17.9
264.119	Post-Closure Notices	17.10
Subpart H		
264.142	Closure Cost Estimate	17.8
264.143	Closure Financial Assurance	18.0
264.144	Post-Closure Cost Estimate	17.11
264.145	Post-Closure Financial Assurance	18.0
Subpart M		
264.280	Closure and Post-Closure Care for Land Treatment	17.4

once the Part B permit application is approved and a permit is issued to Burlington Northern. The total land treatment area is 26 acres in size with plans to expand an additional 12 acres in 1990. The closure schedule is listed in Table 17-2.

After notification of closure to the Regional Administrator, Burlington Northern will apply for an extension to the closure requirement time period of 180 days (40 CFR 264.113). Literature on the land treatment of creosote wastes and information from the Paradise land treatment demonstration indicate that full treatment of the waste will require a period of four to five years after the last waste has been applied. Monitoring of the groundwater, the unsaturated zone and the soil will continue during this period of removal of hazardous waste and hazardous waste constituents through treatment. Also the run-on and run-off control systems will be maintained.

The closure treatment period will be completed when soil sampling and analysis show that the hazardous waste and hazardous waste constituents are completely degraded, transformed to non-hazardous constituents, or immobilized rendering the soil non-toxic to plant life. Final closure will begin at this stage with the installation of the vegetative cover.

The vegetative cover will be seeded using a drill with double disc openers, depth barrels, seed metering device, seed box agitator, and packer wheels. The area will be drilled twice with each operation planting one-half the seeding rate. The second operation will occur over the first operation in a configuration that will reduce riffling and washing of the seed. Planting depth will be one-half inch. A seeding rate of approximately 15 pounds per acre will be used consisting of the following mix:

TABLE 17-2

CLOSURE SCHEDULE

	Closure Activity	Maximum Time from Initiation of Final Closure to Completion of Closure Activity
1.	Last volume of hazardous material removed from facility	1 day
2.	Removal of hazardous waste and hazardous waste constituents through treatment	4 to 5 years
		Maximum Time since Completion of Removal Through Treatment
2.	Decontamination of equipment and irrigation system	3 days
3.	Soil sampling and analysis	15 days
4.	Installation of vegetative cover	30 days
5.	Certification of closure completion by an independent registered professional engineer	60 days

Tall Wheatgrass (Orbit)	30 percent	4.50 lb/ac
Streambank Wheatgrass (Sodar)	20 percent	3.00 lb/ac
Meadow Foxtail	20 percent	3.00 lb/ac
Annual Ryegrass	15 percent	2.25 lb/ac
Birdsfoot Trefoil (Cascade)	15 percent	2.25 lb/ac

Fertilizer will be added to the planting following seed application. Part of the fertilizer will be place with the seed, and the remainder will be broadcast over the planting surface. After seeding, two tons per acre of clean straw or native hay will be spread over the seeded areas. If straw is used, the majority of the stems will be 12 inches or longer without seed heads. The mulch will be anchored approximately three inches into the seedbed using a disc with notched coulters.

The surface water (if any) collected in the run-off collection ponds will be pumped into the sprinkling system and irrigated on the land treatment area.

The run-on and run-off control system will remain in place, including the berms around the land treatment facility, for the closure and post-closure care period.

The total time required for closure including the removal through treatment period is estimated at a maximum period of five years and 60 days.

17.4 Decontamination Requirements (40 CFR 264.114)

All the equipment associated with the land treatment operation, e.g., the haul trucks and the tilling equipment will be decontaminated on-site using a steam wash and rinse. The rinse water will be collected and irrigated on the land treatment area.

The land treatment irrigation pipe, pump, and sprinklers will be decontaminated using a steam wash and rinse. The rinse water from this operation will also be disposed onto the land treatment area.

17.5 Maximum Waste Inventory (40 CFR 264.112(b)(3))

The estimated total inventory of creosote contaminated soils and sludges now stored in the Paradise waste pile is approximately 18,000 cubic yards. It is anticipated that more creosote contaminated soils and sludges from Somers will be shipped to Paradise in the future and treated at the Paradise land treatment facility. The total estimated quantity of this new Somers waste is approximately 18,000 cubic yards. An undetermined amount of soils as a result of SWMU investigations at Paradise may also be generated.

17.6 Amendment of Closure Plan (40 CFR 264.112(c))

Burlington Northern will amend the closure plan whenever any change in operating procedures or change in the design of the land treatment area affects the Closure Plan. However, once land treatment begins at the site, no change in operating plans or facility design is expected.

17.7 Certification of Closure (40 CFR 264.115)

Periodic inspections of the closure activities will be made by an independent registered professional engineer to insure that the facility has been closed in accordance with the closure plan specifications. Within 60 days of completion of closure, Burlington Northern will submit to the regional administrators of EPA and MDHES closure certification by both Burlington Northern and an independent registered professional engineer.

17.8 Closure Cost Estimate (40 CFR 264.142 and ARM 16.44.804)

Burlington Northern will keep this written estimate of closure cost and any subsequent estimates on file at the office of the Burlington Northern Regional Environmental Engineer.

Table 17.3 summarizes all closure costs. Closure cost estimates are based on actual rates Burlington Northern is paying for certain services, average contractor estimates, and best engineering estimates.

These cost estimates will be adjusted whenever changes in the closure plan affect the associated costs. Also, Burlington Northern will adjust the closure cost estimates annually to reflect the inflation over the previous year by using an inflation factor derived from the annual Implicit Price Deflator for Gross National Product as published by the U.S. Department of Commerce.

Costs associated with closing the land treatment facility include:

- Inspections. Facility inspections will be focused on the drainage swales and berms, and on the security system which includes the facility gates, fencing and signing. Inspections will be conducted quarterly for the five year closure period. A total of 20 inspections will be completed at a cost of $100 per inspection.
  Total cost for inspections is $2,000.

- Continuation of Tilling. The tilling of the land treatment area will continue during the treatment through removal period to insure that full treatment of the creosote waste is achieved. The tilling will be conducted biweekly for six months per year for the five year period. The cost for each tilling is $450.
  Total cost for tilling of the land treatment area is $27,000.

- Maintenance of Run-on and Run-off Control System. Monthly inspections will be conducted for the interim removal through treatment period for a maximum of five years or a total of 60 inspections at a cost of $100 per inspection. Also the cost of maintaining the run-on and run-off drainage systems is estimated at $5,000/year.
  Total cost for maintenance of the run-on and run-off control systems is $31,000.

TABLE 17-3

CLOSURE COST ESTIMATE FOR THE PARADISE LAND TREATMENT FACILITY

	Closure Activity	Cost Estimate
1.	Inspections	$2,000
2.	Continuation of tilling	$27,000
3.	Maintenance of run-on and run-off control system	$31,000
4.	Soil sampling	$161,000
5.	Unsaturated zone sampling	$153,000
6.	Groundwater sampling	$81,000
7.	Decontamination of equipment	$400
8.	Decontamination of irrigation system	$800
9.	Vegetation cover	$88,400
10.	Certification of closure, surveys, and notices	$2,500
11.	Subtotal	$547,100
12.	Contingencies (15 percent of line 11)	$82,065
13.	Administrative Costs (15 percent of line 11)	$82,065
14.	Total cost of land treatment facility closure	$711,230

- Soil sampling. During the removal through treatment period, soil core sampling will continue. The same parameters and analytical methods will be used for closure as per the operating period. Fourteen soil cores will be collected throughout the 26 acre facility. Three samples will be collected per soil core for a total of 42 samples per event. Two sampling events will take place per year. The cost for each sample analysis is $300 and the labor cost per sampling event is $3,000. Total cost for analysis of 420 samples is $126,000. Total labor costs for 10 sampling events is $30,000. The cost associated with data preparation, interpretation, statistical analyses and report preparation is $1,000 per year.
  The total cost for soil sampling for the interim period of five years is $161,000.

- Unsaturated Zone Sampling. Sampling of the unsaturated zone will continue through the interim removal through treatment period. The same parameters and analytical methods will be used during closure as per the operating period. Sixteen samples will be collected per sampling event with four sampling events per year. The cost for analysis per sample is $400 and the labor cost for per sampling event is $1,000. The total cost for analysis from 20 sampling events is $128,000. Total labor costs are $20,000. The cost for data preparation and reporting is $1,000 per year.
  Total cost for unsaturated zone sampling for the interim period of four years is $153,000.

- Groundwater Sampling. Sampling of the groundwater will continue through the interim removal through treatment period. The same parameters and analytical methods will be used for closure as per the operating period. Eleven samples will be collected per sampling event with two sampling events per year. The cost for analysis per sample is $600 and the labor cost for per sampling event is $1,000. The total cost for analysis of 110 samples is $66,000. Total labor costs are $10,000. The cost associated with data preparation, interpretation, statistical analyses and reporting is $1,000 per year.
  Total cost for groundwater sampling for the interim period of four years is $81,000.

- Decontamination of Equipment. The tractor, tiller and haul trucks used in the land treatment operation will be steam cleaned and rinsed. Steam cleaning is estimated to take eight hours at $50 per hour.
  Total cost of equipment decontamination is $400.

- o Decontamination of the Irrigation Equipment. The pump, pipes, and sprinklers will be steam cleaned and rinsed. Steam cleaning of this equipment is estimated to take 16 hours at $50 per hour.
  Total cost of irrigation equipment decontamination is $800.

- o Vegetative Cover. A maintenance-free native vegetative cover will be established on the land treatment facility as described in Chapter 17.3. Average contractor estimates for establishing a vegetative cover are $3,400 per acre. The land treatment facility is 26 acres.
  Total cost for the vegetative cover is $88,400.

- o Certification of Closure, Surveys, and Notices. Certification by a independent registered professional engineer is required which assumes that the land treatment facility has been closed in accordance with the closure plan. Additionally a survey plat of the land treatment facility will be prepared and certified by a professional registered land surveyor and a notice in deed will be prepared. Each certification is estimated to cost $1000. The notice in deed will is estimated to cost $500.
  Total cost for certification of closure is $2500.

- o Contingencies. A general provision for contingencies of 15 percent of the closure subtotal has been included.
  Total cost for contingencies is $82,065.

- o Administrative costs. For administrative and supervisory tasks, a total of 15 percent of the closure subtotal has been included.
  Total cost for adminstration is $82,465.

- o Total cost for closure of the Paradise land treatment facility is $711,230.

17.9 Post-Closure Plan (40 CFR 264.117; 264.118; 264.120 and 264.280)

Post-closure care for the Paradise land treatment facility will continue for 30 years after closure is completed. The post-closure care will include inspection and maintenance of the run-on and run-off control system, inspection of the facility

security system, unsaturated zone monitoring, soil monitoring, and groundwater monitoring. The vegetative cover will control wind dispersal and stormwater erosion of any hazardous waste which may present in the soil following closure. The following text will describe in detail the specific operation of the post-closure care.

17.9.1 Run-on and Run-off Control System

The existing stormwater management system will be maintained throughout the post-closure care period. The berms which surround the land treatment facility will remain in place to prevent run-on from storms and floodwater from the Clark Fork River from washing out the land treatment area. The run-off collection ponds will remain in place and collect any stormwater that falls within the land treatment area.

Inspections of the run-on and run-off control system will be conducted quarterly for the first year and then biannually thereafter.

17.9.2 Security

Inspections of the security system which includes the fencing, locked gates, and signs will be conducted on a quarterly basis for the first year and then biannually thereafter. Any damage noticed in the inspections will be repaired immediately.

17.9.3 Soil Monitoring

The soils beneath the land treatment area will be sampled and analyzed to determine if any hazardous waste or hazardous waste constituents have migrated below the treatment zone. Soil monitoring will be conducted on a frequency of 0.5, 1.0, 2.0, 4.0, 8.0, 16.0, and 30.0 years after closure. Soil cores will be collected using the same procedures as outlined in the operating

plan. The parameters to be used will be EPA Analytical Method 8310 or Base Neutral/Acid Extractables using EPA Analytical Method 8270.

17.9.4 Unsaturated Zone Monitoring

Monitoring of the soil pore liquids will continue through the post-closure care period and sampling will be conducted on a frequency of 0.5, 1.0, 2.0, 4.0, 8.0, 16.0, and 30.0 years after closure. The unsaturated zone monitoring locations used for post-closure care period will be the same as those used for the operating period of the facility. The following parameters will be analyzed at each sampling location: base neutral extractables using EPA Analytical Method 8270.

17.9.5 Groundwater Monitoring

Groundwater monitoring will be continued through the post-closure care period on a frequency of 0.5, 10., 2.0, 4.0, 8.0, 16.0, and 30.0 years. The groundwater monitoring locations used for the post-closure care period will be the same as those used for the operating period of the facility. The following parameters will be analyzed at each monitoring well: the sixteen PAH compounds listed in Table 42-1 using either EPA Analytical Method 8270.

If a statistical significant increase over background is detected in any monitoring point in the groundwater detection system, then Burlington Northern will initiate the groundwater compliance program described in Chapter 45 of this application.

17.9.6 Amendment of Post-Closure Plan (40 CFR 264.118(d))

Burlington Northern will amend the post-closure plan whenever any change in the operating procedures, in the design of the land treatment facility, or in the design of any of the

environmental monitoring systems affects the post-closure as written to date. A request for permit modification involving the post-closure plan will be submitted in writing to the EPA Regional Administrator and the DHES Administrator (1) within 60 days after an unexpected event has occurred which affects the post-closure plan or (2) 60 days prior to a proposed change in the facility operation or design.

17.9.7 Post-Closure Certification (40 CFR 264.120)

Burlington Northern will submit by registered mail certification of post-closure to the EPA Regional Administrator and the DHES Administrator that the post-closure care period of the Paradise land treatment facility was performed in accordance with this approved post-closure plan. The certification will be signed by an independent registered professional engineer.

17.9.8 Facility Contact (40 CFR 264.118(a)(3)

The facility contact during the post-closure care period is:

Mr. Mel Burda
Regional Environmental Engineer
Burlington Northern Railroad
9401 Indian Creek Parkway
Overland Park, Kansas 66210
Telephone number: (913) 661-4439

17.10 Post-Closure Notices (40 CFR 264.119)

Burlington Northern will submit to the local zoning authority and to the EPA Regional Administrator and the Montana State Administrator a record of the type, location, and quantity of hazardous waste disposed at the Paradise land treatment facility. This submittal will be no later than 60 days after certification of closure.

A notation on the deed to the facility property will be made within 60 days of certification of closure that will state that

the land has been used to manage hazardous wastes, its use is restricted under 40 CFR 264 Subpart G, and that the survey plat and record of type, location, and quantity of hazardous waste disposed at the Paradise land treatment facility have been filed with the local zoning authority. A certification, signed by a Burlington Northern official, stating that Burlington Northern has recorded the notation on the deed to the property will be submitted to the EPA Regional Administrator and the Montana State Administrator. The document containing the property deed hazardous waste notation will be included in the above submittal.

17.11 Post-Closure Cost Estimate (40 CFR 264.144)

Burlington Northern will keep this written estimate of the post-closure cost and any subsequent estimates on file at the office of the Burlington Northern Seattle Regional Environmental Engineer. Table 17-4 summarizes all post-closure costs. Closure cost estimates are based on actual rates Burlington Northern is paying for certain services, average contractor estimates, and best engineering estimates.

These cost estimates will be adjusted whenever changes in the closure plan affect the associated costs. Also, Burlington Northern will adjust the closure cost estimates annually to reflect the inflation over the previous year by using an inflation factor derived from the annual Implicit Price Deflator for Gross National Product as published by the U. S. Department of Commerce.

Costs associated with post-closure of the Paradise land treatment facility include:

- Inspections. Facility inspections will be focused on the stormwater management system which includes the drainage swales and berms and the security system including the fencing, gates and signing. The inspections will be conducted a total of 62 times for the post-closure period at a cost of $100 per inspection.
  Total cost for inspections is $6,200.

TABLE 17-4

POST-CLOSURE COST ESTIMATE
FOR THE PARADISE LAND TREATMENT FACILITY

	Post-Closure Activity	Cost Estimate
1.	Inspections	$6,200
2.	Groundwater monitoring	$60,200
3.	Unsaturated zone monitoring	$58,800
4.	Soil monitoring	$116,200
5.	Certification of post-closure	$1,000
6.	Subtotal	$242,400
7.	Contingencies (15 percent of line 9)	$36,360
8.	Administrative Costs (15 percent of line 9)	$36,360
9.	Total cost of land treatment facility post-closure	$315,120

- Groundwater Monitoring. The cost for labor and materials for each sampling event is $1,000 and for a total of seven sampling events, the cost is $7,000. The cost for analysis for each sample is $600. There are 11 wells in the groundwater monitoring network and with one sample per well the cost of analysis per sampling event is $6,600. The total cost for analysis for seven sampling events is $46,200. The cost associated with data preparation, interpretation, statistical analysis, and report preparation for each sampling event is $1,000. The total cost for data preparation for seven sampling events is $7,000.
  Total cost for groundwater monitoring is $60,200.

- Unsaturated Zone Monitoring. The cost for labor and materials for each sampling event is $1,000 and for a total of seven sampling events, the cost is $7,000. The cost for analysis for each sample is $400. There are 16 lysimeters in the unsaturated zone monitoring network and with one sample per lysimeter the cost of analysis per sampling event is $6,400. The total cost for analysis for seven sampling events is $44,800. The cost associated with data preparation, interpretation, statistical analysis, and report preparation for each sampling event is $1,000. The total cost for data preparation for seven sampling events is $7,000.
  Total cost for the unsaturated zone monitoring is $58,800.

- Soil Monitoring. Soil core collection will be conducted at 14 sites during each sampling event. At each soil collection site, three soil samples will be collected for each soil zone. A total of 42 soil samples will be collected for each sampling event. The labor and materials cost for each sampling event is $3,000 and for a total of seven sampling events the cost is $21,000. The cost for analysis for each soil sample is $300 and with 42 samples collected per sampling event, the total cost for soil analysis for seven sampling events is $88,200. The cost associated with data preparation, interpretation, statistical analysis, and report preparation for each sampling event is $1,000. The total cost for data preparation for seven sampling events is $7,000.
  Total cost for the soil monitoring is $116,200.

- Certification of Post-Closure. Certification by a independent registered professional engineer is required which assumes that post-closure of the land treatment facility has been conducted in accordance with the post-closure plan.
  Total cost for post-closure certification is $1000.

- Contingencies. A general provision for contingencies of 15 percent of the post-closure subtotal has been included.
  Total cost for contingencies is $36,360.

- Administrative costs. For administrative and supervisory tasks, a total of 15 percent of the post-closure subtotal has been included.
  Total cost for adminstration is $36,360.

- Total cost for post-closure of the Paradise land treatment facility is $315,120.

MODULE IV.LT

GROUNDWATER MONITORING

MODULE IV.LT PARADISE LAND TREATMENT UNIT
GROUNDWATER MONITORING

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MODULE IV.LT PARADISE LAND TREATMENT UNIT
GROUNDWATER MONITORING

A. APPLICABILITY

1. The requirements of this module shall pertain to the BN Paradise Land Treatment Unit identified in Permit Condition II.A.3.

2. Permit modification provisions under Condition E. 11. of this module shall be followed in defining the specific well placement and other requirements to be followed for groundwater monitoring.

3. The Permittee must follow all of the provisions under ARM 16.44.702, and the following rules regarding water quality protection in the Montana Water Quality Act: ARM 16.20.201-260, ARM 16.20.601-643, ARM and 16.20.701-705 and ARM 16.20.1001-1025 and as defined by these permit conditions.

4. For purposes of this permit, the ARM 16.44.702 regulations and provisions for detection and compliance monitoring shall be defined specifically for the Land Treatment Unit compliance points under 40 CFR 264, Subpart F as incorporated by reference in ARM 16.44.702 except as determined by the Department. The surface location of the BN Paradise Land Treatment Unit is defined in Permit Condition II.A.3. The proposed Land Treatment Unit and compliance points defined below are shown in Attachment IV.LT.1. Condition 4.a. below applies if the Land Treatment Unit falls within the solid line boundary marker on the site map in Attachment IV.LT.1; condition 4.b. below applies if the Land Treatment Unit falls within the solid and dotted line boundary marker on the site map.

a. The points of compliance are a line encircling this unit at the toe of the outer berm. Wells 46, 47, 48, 49, 50, 51, 52, 53, 54, and 4 as shown in Attachment IV.LT.1. shall serve as the following monitoring wells for the Land Treatment Unit:

   i. compliance point wells shall be wells number 4, 46, 47, 48, 49, 50, 51, and 54;

   ii. background wells shall be wells number 52, and 53;

b. If the Permittee adds acreage under Permit Condition III.LT.C.1., the surface location of the BN Paradise Land Treatment Unit is defined as the areas shown on the site map in Attachment IV.LT.1. enclosed by solid and dotted lines. The points of compliance are a line encircling this unit at the toe of the outer berm. Waste cannot be applied to the areas within the dotted lines before monitoring wells 55 and 56 are installed and approved by the Department. Wells 46, 47, 48, 49, 50, 52, 53, 54, 55, 56 and 4 as shown in Attachment IV.LT.1. shall serve as the following monitoring wells for the Land Treatment Unit:

   i. compliance point wells shall be wells number 4, 46, 47, 48, 49, 50, 54, 55 and 56;

   ii. background wells shall be wells number 52, and 53;

5. Regulated units subject to these provisions may only be excluded based on the criteria set forth in 40 CFR 264.90(b) as incorporated by reference in ARM 16.44.702. The regulations and conditions of this permit for groundwater monitoring apply during the active life of the Land Treatment

Unit including the closure period, and as defined in 40 CFR 264 Subparts F, G and M as incorporated by reference in ARM 16.44.702 during compliance and post-closure periods.

B. REQUIRED PROGRAMS

1. The Permittee shall conduct a monitoring and response program as follows for all units subject to these provisions:

   a. Whenever one or more hazardous constituents under 40 CFR 264.93 as incorporated by reference in ARM 16.44.702 from the Land Treatment Unit exceeds the critical levels given in Attachment IV.LT.3.a. at the compliance point(s) defined under the conditions of this Permit, the Permittee shall institute a compliance monitoring program as defined in this Module, and 40 CFR 264.99 as incorporated by reference in ARM 16.44.702.

   b. Whenever the groundwater protection standard under Condition IV.C of this Permit is exceeded, the Permittee shall institute a corrective action program under 40 CFR 264.100 as incorporated by reference in ARM 16.44.702 and Condition G of this module.

   c. Whenever hazardous constituents under 40 CFR 264.93 as incorporated by reference in ARM 16.44.702 exceed critical levels as defined by Condition D.1. of this Module in the groundwater between the compliance point(s) defined in Condition A.4. of this Module and the facility property boundary, the Permittee shall institute a corrective action program under 40 CFR 264.100 as incorporated by reference in ARM 16.44.702 and Condition G of this Module; or

d. In all other cases, the Permittee shall institute and maintain a detection monitoring program under 40 CFR 264.98 as incorporated by reference in ARM 16.44.702 and Condition E. of this Module.

2. The Permittee shall follow all of the elements of these required programs as defined in this Module of the Permit. The Department may include one or more of the programs in paragraph 1 above as may be necessary to protect human health and the environment and will specify the circumstances under which each of the programs may be required.

C. GROUNDWATER PROTECTION STANDARD

The Department shall establish groundwater protection standards for each hazardous constituent that has entered groundwater at the time the detection monitoring program or other evidence indicates that hazardous constituents have entered groundwater beneath a regulated unit. The Department shall also determine at such time the hazardous constituents to which the protection standard applies as defined in 40 CFR 264.93 as incorporated by reference in ARM 16.44.702, the concentration limits as defined in 40 CFR 264.94 as incorporated by reference in ARM 16.44.702, the point(s) of compliance under Condition A.4. of this Module and 40 CFR 264.95 as incorporated by reference in ARM 16.44.702. At the time of permit issuance, the Department has determined that monitoring evidence does not indicate groundwater contamination from the Land Treatment Unit and that maintenance of a detection monitoring system at the Land Treatment Unit is appropriate. In the event of groundwater contamination from the Land Treatment Unit, the Groundwater Protection Standard under Permit Condition IV.C. (Attachment IV.2.) will apply.

D. GENERAL GROUNDWATER MONITORING REQUIREMENTS

1. Critical levels or values for an analyte are defined for purposes of detection monitoring. A critical level is a statistical estimate of the maximum likely concentration for a given analyte expected to be found in a groundwater monitoring sample based on background water quality. The critical level is specified for a given confidence level, background sample size, and assumptions about the background population distribution. For analytes which are not detected in background, the practical quantitation limits given in Attachment IV.LT.3.a. shall be the critical limit. For analytes having quantifiable values in background, except for arsenic and lead, the critical level shall be established through a statistical procedure defined in Condition IV.LT.E.4.f.ii. The critical level shall also be reconfirmed through the use of a repeat testing procedure as specified in the permit.

2. General

The Permittee shall comply with the following general requirements for groundwater monitoring:

a. The groundwater monitoring system shall consist of a sufficient number of wells, installed at appropriate locations and screened at appropriate depths to yield groundwater samples that represent the quality of background water that has not been affected by leakage from a regulated unit and represents the quality of groundwater passing the point of compliance.

b. A single groundwater monitoring system has been defined for the Land Treatment Unit in accordance with 40 CFR 264.97(b) as incorporated by reference in ARM 16.44.702.

c. For any new regulated unit, a groundwater monitoring system shall consist of a sufficient number of wells, installed and screened at appropriate locations to yield groundwater samples that represent the quality of background water that has not been affected by leakage from a regulated unit and that represents the quality of groundwater passing the point of compliance. If the Department determines that background groundwater quality for new units cannot be adequately determined with an upgradient well, an alternative monitoring well network shall be installed upon approval by the Department. The Permittee shall maintain monitoring wells specified in Condition A.4. of this Module.

d. All new monitoring wells shall be constructed in accordance with the provisions in 40 CFR 264.97(c) as incorporated by reference in ARM 16.44.702 and Condition D.3. of this Module.

e. The groundwater monitoring program shall include consistent sampling and analysis procedures defined in 40 CFR 264.97(d) as incorporated by reference in ARM 16.44.702 and Condition D.4. of this Module.

f. The Permittee shall follow requirements for measurement of the groundwater surface elevation as specified in Condition D.5. of this Module.

g. The Permittee shall follow requirements in Condition D.7. of this Module for establishing background water

quality for specified hazardous constituents and monitoring parameters defined in Condition D.6. of this Module.

h. The Permittee shall follow the procedures for statistical evaluation in determining whether critical levels have been exceeded as defined in Condition E.4.f. of this Module.

3. New Well Location and Construction

a. New well construction shall follow the techniques described in the Technical Enforcement Guidance Document (TEGD), OSWER-9950.1, September 1986 unless the Permittee can demonstrate to the Department or the Department can determine that an alternative technique is appropriate for protection of human health and the environment. All monitoring wells shall be cased in a manner that maintains the integrity of the monitoring well bore hole. Casing and screen shall be stainless steel unless the Permittee can demonstrate that an alternative material is appropriate for protection of human health and the environment. This casing shall be screened or perforated and packed with gravel or sand where necessary (i.e., the space between the bore hole and well casing) and shall be sealed to prevent contamination of samples and the groundwater.

b. The Permittee shall develop and maintain new monitoring wells in accordance with TEGD guidance unless the Permittee can demonstrate to the Department or the Department determines that an alternative technique is appropriate for protection of human health and the environment. The Permittee shall submit monitoring well

completion reports which include boring logs, sieve analysis (grain size) and standard penetration tests if performed, results from all analytical tests performed on soils (Atterberg limits, etc), water level elevations, water contour maps including the latest surveyed wellhead reference elevations, well development results including recharge rates, cross sections or fence diagrams as well as all other pertinent data within 90 days after completion of wells installed after permit issuance.

c. Additional saturated zone monitoring wells shall be installed to maintain compliance if subsurface conditions significantly change after permit issuance. Such changes may include but are not limited to, water level elevation or apparent flow direction changes, or detection of organic constituents in a well. The Department may require the Permittee to install and sample additional wells at any time during the active life, closure, or post-closure or compliance periods if new information or unforeseen circumstances reveal a need for additional monitoring to protect human health and the environment.

d. Existing monitoring wells shall be maintained in a fully operating condition for the duration of this permit. The Permittee shall notify the Department when a well is no longer properly functioning (including a marked change in pumping rate, presence of sandy or silty materials, and cracked or broken casings) or when the Permittee intends to close one or more wells associated with the Land Treatment Unit. The Department shall specify the conditions for replacement or correction of improperly operating well(s). Well integrity of all monitoring wells listed in Condition A.4. of this Module shall be

monitored by the Permittee and reported to the Department according to the following schedule:

i. well depths shall be measured at least once a year;

ii. a visual well inspection for evidence of well damage shall be performed every sampling event;

iii. sample and analyze for total iron at least annually.

4. Sampling and Analysis Procedures

a. The Permittee must maintain consistent sampling and analysis procedures in the groundwater monitoring program that are designed to ensure reliable monitoring results of groundwater quality below the regulated unit. At a minimum, the program shall include procedures and techniques for sample collection, sample preservation and chain-of-custody control.

b. The sampling and analytical methods must be appropriate for groundwater sampling and accurately measure hazardous constituents in groundwater samples.

c. Samples shall be collected, preserved and transported and a chain-of-custody record maintained in accordance with the procedures specified in the latest edition of the EPA publication: SW-846, Test Methods for Evaluating Solid Waste: Physical-Chemical Methods (SW-846), and Attachment IV.LT.5. For the purposes of references to SW-846 throughout this Permit, later editions of SW-846 supercede the September, 1986 edition currently in use. Quality assurance and quality control (QA/QC) procedures for field and laboratory analyses shall be followed as

specified in SW-846, unless otherwise specified under Condition D.4.e. of this Module.

d. Bladder pump operation and maintenance shall include the following procedures:

i. Bladder integrity shall be checked before each sampling event by observing whether sample discharge flow contains gas bubbles.

ii. Bladder pump operational condition shall be monitored by comparing trends in discharge volume throughout purging. Decreases of 20% or more in discharge volume indicate either solids accumulating in the pump or gas leaks in the system.

iii. If the bladder pump shows signs of damage, it shall be replaced or repaired before sampling continues for the well.

iv. When sampling, flow rate shall be in the range of 100 milliliters per minute to fill sample containers without aeration or splashing.

e. The Permittee shall ensure that all laboratory analyses undertaken as part of a Permit condition contain adequate quality assurance and quality control (QA/QC) procedures. The laboratory must be capable of evaluating quality control procedures as specified in SW-846. The laboratory must also have quality control and backup information available for specific analyses, which shall be reported to the Department along with the sample analytical results as described in Condition E.3.c.i-iv. of this Module. Water samples shall be analyzed according to the methods and procedures specified in

SW-846 in addition to the following:

i. The Permittee shall submit all lab QA/QC documentation and supporting data required under the detection monitoring or compliance monitoring program. The Permittee shall retain, either at the laboratory or at the facility, the raw organics information for required sampling and analysis, including organics gas chromatographic printouts, mass spectral analyses, QA/QC surrogate and spiking results, etc. These data shall be retained for a period of not less than three years.

5. Groundwater Elevation

The Permittee shall determine the groundwater surface elevation using the methods and procedures outlined in Attachment IV.LT.5. in all monitoring wells identified in Condition A.4. of this Module whenever the wells are sampled, and no less frequently than semi-annually unless the Land Treatment Unit is undergoing Compliance Monitoring or if otherwise instructed by the Department.

6. Monitoring Parameters

For purposes of the groundwater monitoring program, there shall be three classes of parameters for measurement and analysis defined as follows:

a. Principal Hazardous Constituents (PHCs): The first class consists of a set of organic hazardous constituents and two metals. These serve as indicator parameters and are listed in Attachment IV.LT.3a. The PHCs are found in significant quantities in the permitted wastes and/or are relatively mobile, and provide a reliable indication of

the presence of hazardous constituents in the groundwater.

b. Water Quality Indicator Parameters: This second class of parameters provides additional information regarding evidence of possible groundwater contamination. These are listed in Attachment IV.LT.3b.

c. Appendix IX Parameters: This list is found in the Appendix IX to 40 CFR Part 264 (Federal Register Volume 52, No. 131). It was developed by the EPA to screen suspected contamination at land-based hazardous waste treatment storage and disposal facilities. Appendix IX compounds are considered analyzable in groundwater by available methods specified in SW-846 and are listed in Attachment IV.LT.4. The Appendix IX parameter list may be modified under Condition F.2. of this Module.

7. Background Groundwater Quality

a. Background groundwater quality represents the quality of groundwater that has not been affected by waste management activities at the proposed Land Treatment Unit.

b. Background groundwater values for the uppermost aquifer underlying the Land Treatment Unit are based on the following information:

i. Analytical data from groundwater samples collected from wells number 4, 31, 32 and the town well before this Permit Module is drafted.

ii. All data from the land treatment background wells number 52 and 53.

iii. Method detection limits and pqls for EPA-recommended methods.

c. At the time of permit issuance, background values for the uppermost aquifer underlying the Land Treatment Unit are as follows:

i. background values for the Land Treatment Unit PHCs are below the critical limits listed in Attachment IV.LT.3.

ii. background values for organic Appendix IX constituents are below the pql for the analytical method in SW-846 yielding the lowest pql for the constituent of concern.

iii. background values for Appendix IX metals are below values listed in Attachment IV.LT.6. of this Module.

d. Background values listed under Condition D.7.c. of this Module may be modified by concentration levels detected in background wells 52 and 53.

8. Other Conditions

a. The Permittee shall monitor all wells covered by this Module semi-annually at a minimum while in the detection monitoring program, and as otherwise specified below.

b. Detection monitoring for PHCs and Water Quality Indicator Parameters listed in Attachment IV.LT.3. shall begin the

first semi-annual period following installation of any newly constructed monitoring wells, unless Condition F of this Module applies. The Permittee shall conduct at least one evaluation of PHC parameters immediately following completion of any new well(s).

c. The Department may modify parameters or methods of analysis, including statistical analysis, for any samples upon written notice to the Permittee, if necessary. Conditions requiring modification may include maintaining or upgrading the quality of type of data produced by the Permittee to account for background conditions, future conditions such as availability of improved analytical methods, the presence of better indicators, or more easily detectable parameters. The Department will also prescribe in writing additional sampling and analysis for wastes contained in a unit or leachate deemed appropriate to determine whether a hazardous constituent may have originated from a unit, to establish appropriate monitoring parameters, or for other reasons.

d. The Permittee shall enter all monitoring, testing and analytical data into the operating record as required by Permit Condition II.0.

e. The Permittee shall provide the Department with groundwater monitoring data in accordance with the Conditions of this Module and Permit Condition I.F.9.

   i. For all groundwater monitoring unless otherwise directed by the Department, the Permittee shall provide the Department within 30 days of the date the Permittee (or any representative of the Permittee retained to process or evaluate analytical data)

receives the analytical results, the information required under IV.LT.E.3.a., a determination whether any quantitated value has exceeded critical levels as defined in Condition D.1.c. of this Module, and any additional analyses deemed appropriate by the Permittee to explain exceedances of critical levels. Appropriate QA/QC information, as described in Condition E.3.c. of this Module, shall accompany all reported data.

ii. The Permittee shall report all groundwater monitoring information required under this Module in accordance with the procedures outlined under Conditions E of this Module, or Condition F if undergoing Compliance Monitoring.

E. DETECTION MONITORING PROGRAM AND DATA EVALUATION

1. Monitoring Parameters

a. The detection monitoring program for the Principal Hazardous Constituents (PHCs) and Water Quality Indicator Parameters listed in Attachment IV.LT.3. shall in general follow the protocol specified by the conditions of this Module. A summary of the detection monitoring protocol is outlined in Attachment IV.LT.7.

b. The Permittee shall ensure that the laboratory use the SW-846 analytical methods recommended for each PHC in Attachment IV.LT.3.

2. Monitoring Network

The Permittee shall sample the monitoring wells identified in Condition A.4. of this Module as follows:

a. Compliance point wells identified in Condition A.4.a.i. or A.4.b.i. of this module shall be sampled at least semi-annually (approximately every six months) of each calendar year for the parameters listed in Attachment IV.LT.3.

b. Background wells identified in Condition A.4.a.ii. or Condition A.4.b.ii. of this module shall be sampled concurrently with the compliance point wells for the parameters listed in Attachment IV.LT.3.

3. Reporting Requirements

The Permittee shall report information required in this section in accordance with the following schedule:

a. Semi-annual reports shall be submitted in accordance with Condition D.8.e.i. of this Module and shall include the following:

i. Analytical methods used, including method number references;

ii. Practical quantitation limits (PQLs) for every parameter tested;

iii. Quality control information pertinent to analysis involved (spikes, duplicates, blanks, etc.) including

acceptance limits for spikes);

iv. Laboratory used;

v. Data sheets provided by the laboratory;

vi. Method detection limits (MDL) for every parameter tested;

vii. Low-level groundwater data shall be reported as follows:

Analyte Concentration	Report
<MDL	Not detected (Give MDL value)
≥MDL but <PQL	Found but not quantified
≥PQL	Numerical value reported

viii. PQLs for volatile organic compounds in groundwater by SW-846, Method 8020, may be no more than ten times the method detection limits given in Table 1 of the method. Analytical results shall be reported in the format given in Condition vii. above;

ix. PQLs for Polycyclic Aromatic Hydrocarbon (PAHs) by SW-846, Method 8310, may not exceed 10 µg/l for naphthalene, acenaphthene, and acenaphthylene or 10 times the MDLs given in Table 1 for the remaining 12 PAHs. Analytical results shall be reported in the format given in Condition vii. above.

x. The Permittee shall submit to the Department the Quality Assurance Plan and the name of a contact person for each analytical laboratory which they use;

xi. QA/QC data required under Condition E.3.C. of this Module;

xii. A determination of whether there has been a statistically significant increase in groundwater as defined in Condition E.4.f. of this Module.

xiii. For all mass spectroscopy analysis, positive identification and quantitation is required for the compounds listed the method. Tentative identification and estimated concentrations must be reported for all other compounds observed in the extract.

b. An annual report shall be submitted during the first quarter of every year that includes the following:

i. static water level measurements taken at all Land Treatment monitoring wells identified in Condition IV.A.4. of this Module throughout the preceding calendar year shall be tabulated and summarized as two potentiometric maps showing elevation of the top of the water table for each for each semi-annual period;

ii. analytical results for the preceding year shall be summarized and submitted to the Department,

iii. measurements of the depth-to-bottom of each well identified in Condition A.4. of this Module.

c. <u>Quality Assurance/Quality Control Reporting Requirements</u>
For compounds listed in Attachment IV.LT.3., the laboratory shall use the analytical method recommended

for each PHC in Attachment IV.LT.3.

i. The Permittee may petition to the Department to use an analytical method that is not recommended in SW-846 (such as GC/MS specific ion monitoring). The alternative method must be able to achieve method detection levels at or below the those listed for the SW-846 methods in Attachment IV.LT.3. Additional or alternative quality assurance/quality control procedures and reporting requirements may be imposed.

ii. Refer to Attachments IV.LT.8. and IV.LT.9. for specific reporting requirements for analysis by HPLC and GC/PID. After permit issuance, the results of the first sampling event shall be accompanied by the completed forms for all samples and parameters. Following the initial sampling, completed forms from these attachments shall be required for one sample for all parameters per semi-annual sampling event. Should the Permittee change laboratories, completed forms will be required for all samples from the first sampling event and one sample per event afterwards.

iii. All reports of analytical results shall include at least one set of replicates, one field blank, one trip blank, and three laboratory blanks for the period spanning the time of analysis.

4. Detection Monitoring Protocol

a. The Permittee shall analyze for the parameters listed in Attachment IV.LT.3. semi-annually for all monitoring wells required under Condition A.4. of this Module, unless the Land Treatment Unit is undergoing compliance

monitoring under Condition F of this Module.

b. For any well where one or more hazardous constituents are found at or above critical levels as defined in Condition D.1., the well shall be re-sampled within 30 days of the Permittee receiving the information unless the Department has determined that a re-sampling is unnecessary. The Permittee may choose to re-sample immediately upon receipt of initial data results, where exceedances of the critical levels are indicated. This re-sample data shall be provided to the Department in compliance with Condition D.8.e.i. of this Module. Re-sampling need only take place for those compounds and at those wells where exceedances of the critical levels are indicated. Water Quality Indicator Parameters (Attachment IV.LT.3b) and static water level shall also be measured during every sampling event.

c. Once the monitoring data has been submitted to the Department, the Permittee may continue to develop evidence which could indicate a source of contamination other than the Land Treatment Unit. The Permittee may return to semi-annual detection monitoring if the following conditions are met:

   i. a satisfactory demonstration is made to the Department that indicates a source of contamination other than the regulated unit; or

   ii. the well(s) where critical-level exceedances are indicated are re-sampled immediately (within seven days of the Permittee receiving the analytical data from the repeat PHC sample) for the Appendix IX constituents in Attachment IV.LT.4; and

iii. results are provided to the Department within seven days of the Permittee receiving the analytical results; and

iv. the results of the Appendix IX analysis show no exceedances above critical levels to be defined by the Department prior to collection of Appendix IX samples. The critical levels will be based on the lowest PQL for the analytical method in SW-846 providing the most sensitivity for that constituent; and;.

v. there were no exceedances above critical levels in the semi-annual sampling event immediately previous to the event that triggered a repeat PHC sampling and analysis specified in Condition E.4.b. of this Module.

d. The Permittee shall submit an assessment report in accordance with Condition E.5. of this Module addressing the probable cause and extent of contamination for the groundwater at the Land Treatment Unit. The report shall be submitted within 90 days of the date the Permittee receives analytical results indicating one or more of the following:

i. the Permittee meets Condition E.4.c. of this Module, and

ii. there were exceedances at or above critical levels of any hazardous constituent in the semi-annual sampling event immediately previous to the event that triggered a repeat PHC sampling and analysis

specified in Condition IV.4.b. of this Module, or

iii. if the Permittee determines pursuant to Condition E.4.f. of this Module that there is a statistically significant indication of contamination in an upgradient well identified in Condition A.4.a.ii. or A.4.b.ii. of this Module, or

iv. if the Permittee determines that any PHC has been detected for the first time in a given well at a concentration level below the critical level and above the detection level as described in Condition E.3.a.vii. of this Module.

e. The Permittee shall be subject to Condition IV.E.4.b. of this Module if the results of the Appendix IX analysis pursuant to Condition IV.E.4.c.ii. of this Module show exceedances at or above critical levels for any constituent.

f. The Permittee must determine whether there is a statistically significant increase in groundwater contamination for any hazardous constituent each time the Permittee determines the concentration of hazardous constituents in the groundwater. A statistically significant increase shall be determined as follows:

i. If repeat sampling under Condition E.4.b. of this Module indicates exceedances of the critical level from at least one hazardous compound in a compliance point well, and the Permittee fails to meet Conditions E.4.c.i or E.4.c.ii. through v. of this Module, the data shall be considered a statistically significant increase in groundwater contamination as

of the date the Permittee receives analytical results from the repeat sampling under Condition E.4.b. of this Module, or

ii. If a hazardous constituent is detected in groundwater samples from a compliance point well and a background well listed in Condition A.4. of this Module, and the Permittee fails to meet Conditions E.4.c.i or E.4.c.ii. through v. of this Module, a statistically significant increase shall be any value greater than the upper tolerance limit calculated from background groundwater quality. The upper tolerance limit shall be calculated from background using the procedure outlined in Attachment IV.LT.10. or by using an alternative statistical test approved by the Department.

g. The Department may consider a number of factors, including the number of statistically significant compounds detected, their concentrations and other indicator information regarding the likelihood and potential severity of contamination in determining the appropriate course of action following a statistically significant finding of contamination. However, unless informed otherwise by the Department, the Permittee shall follow the prescribed courses of action in the following conditions of this Module. The required reporting protocol is summarized in Attachment IV.LT.7.

h. If the Permittee determines, pursuant to Condition E.4.f. of this Module that there is a statistically significant indication of contamination in a compliance point well, he or she shall submit to the Department an application for a permit modification and plan to

establish a compliance monitoring program for the Land Treatment Unit to meet the requirements of 40 CFR 264.99 as incorporated by reference in ARM 16.44.702. The plan shall be submitted within 90 days of an analysis which shows a statistically significant increase in PHC parameters. The application and plan shall include the following information:

i. sampling and identification of the concentration of any Appendix IX constituents (Attachment IV.LT.4.) found in the groundwater at each monitoring well identified in Condition A.4. of this Module.

ii. any proposed changes to the groundwater monitoring system at the facility necessary to meet the requirements of 40 CFR 264.99 as incorporated by reference in ARM 16.44.702;

iii. any proposed changes to the monitoring frequency, sampling and analysis procedures used at the facility necessary to meet the requirements of 40 CFR 264.99 as incorporated by reference in ARM 16.44.702; and

iv. for each hazardous constituent found at the compliance point, a proposed concentration limit or a notice of intent to seek a variance under 40 CFR 264.94(b) as incorporated by reference in ARM 16.44.702.

5. Assessment Report Reporting Requirements

The Permittee shall submit an assessment report if required under Condition E.4.d. of this Module to the Department. The assessment report shall include:

a. probable source of the contamination and justification for that determination, and

b. expected extent of the contamination, and

c. history of previous reportable PHC data at the Land Treatment Unit addressed in the assessment report, and

d. proposed changes in the monitoring program, and

e. a remedial plan, and

f. other information deemed appropriate by the Department.

6. Engineering Feasibility Plan and Conditions for Seeking a Variance

The Permittee shall submit within 180 days to the Department all data necessary to justify any variance sought under 40 CFR 264.94(b) as incorporated by reference in ARM 16.44.702 and an engineering feasibility plan for a corrective action program necessary to meet the requirements of 40 CFR 264.100 as incorporated by reference in ARM 16.44.702, unless:

a. all hazardous constituents identified under this section are listed in Table 1 of 40 CFR 264.94 as incorporated by reference in ARM 16.44.702, (Attachment IV.LT.2) and their concentrations do not exceed the respective values given in that Table, or

b. the Permittee has sought a variance under 40 CFR 264.94(b) as incorporated by reference in ARM 16.44.702

for each hazardous constituent identified at a compliance point.

7. Demonstration of Contamination from Another Source

The Permittee may demonstrate that a source other than the Land Treatment Unit caused the increase or that the increase resulted from error in sampling, analysis, or evaluation. The Permittee is not relieved of the burden of submitting a plan and permit modification under Condition E.4.h. of this Module unless the demonstration made under this paragraph successfully shows that a source other than the Land Treatment Unit caused the increase or the increase resulted from an error in sampling, analysis or evaluation. In making such a demonstration, the Permittee shall:

a. Notify the Department in writing within seven days of determining a statistically significant increase under Condition E.4.f. of this Module that the Permittee intends to make a demonstration under this paragraph;

b. Within 90 days of determine a statistically significant increase under Condition E.4.f. of this Module submit a report to the Department which demonstrates that a source other than the Land Treatment Unit caused the increase, or that the increase resulted from error in sampling, analysis or evaluation;

c. Within 90 days of determining a statistically significant increase under Condition E.4.f.of this Module submit to the Department an application for a permit modification and plan to make any appropriate changes to the detection monitoring program at the facility; and

d. Continue to monitor in accordance with the detection monitoring program established under this section.

8. Water Quality Indicator Parameters

a. The Permittee shall also monitor all water quality indicator parameters listed in Attachment IV.LT.3b. at each semi-annual sampling interval at all wells under this Module.

b. The Permittee shall provide an analysis of each of the background parameters as follows, to be provided with each sampling reporting:

i. data for each parameter shall be assembled in understandable form for all sampling activities, for all wells in the facility monitoring system;

ii. The Permittee shall determine whether there has been a significant change at each monitoring well for each parameter described in Attachment IV.LT.3. using procedures and methods that meet the requirements of 40 CFR 264.97(h) as incorporated by reference in ARM 16.44.702 or by using a graphic technique approved by the Department.

iii. The Department shall utilize these data and information in assessing the effect of the regulated unit on groundwater quality as required under the Montana Water Quality Act.

9. Quality Assurance/Quality Control

The Permittee shall ensure that all laboratory analyses undertaken as part of the permit contain adequate quality control and quality assurance. The laboratory must be capable of evaluating quality control procedures as specified in SW-846. The laboratory must also have quality control and backup information available for specific analyses, which can be accessed if necessary.

10. Recordkeeping

a. The Permittee shall enter all monitoring, testing and analytical data into the operating record as required by Condition II.O. of this Permit.

b. The Permittee shall provide the Department with groundwater monitoring data in accordance with the Conditions of this Module.

11. Permit Modification

a. If the Permittee or the Department determines that the detection, compliance monitoring, or corrective action program required by this permit no longer satisfies the requirements of the regulations, the Permittee must, within 90 days of this determination, submit an application for a permit modification to make any appropriate changes to the program which will satisfy the regulations.

b. The Permittee must assure that monitoring and corrective action measures necessary to achieve compliance with the Groundwater Protection Standard under Conditions IV.C.

and IV.LT.C. of this Permit are taken during the term of the Permit modification and plan approval.

F. COMPLIANCE MONITORING REQUIREMENTS

1. The compliance monitoring program and assessment shall apply to Compliance Point wells identified in Condition A.4. of this Module at the time the second successive sample shows positive and significant indications of contamination as described in Condition E.4.f. of this Module, and shall extend throughout the compliance period as defined in Condition F.3. The compliance monitoring program shall consist of quarterly sampling of:

   a. the Principal Hazardous Constituents and Water Quality Indicator Parameters listed in Attachment IV.LT.3.

   b. any additional hazardous constituents the Department determines to be appropriate indicator parameters.

2. The Permittee must analyze samples from all Compliance Point wells identified in Condition A.4. of this Module for all constituents contained in the Appendix IX list in Attachment IV.LT.4 at the beginning of the compliance period and on an annual basis to determine whether additional hazardous constituents are present in the uppermost aquifer.

   a. The Permittee may petition to the Department for a modification of the Appendix IX list in Attachment IV.LT.4. Such a petition shall contain:

      i. a list of Appendix IX compounds or groups of compounds reasonably expected to be found in or derived from the stored waste, and

ii. a justification for elimination of any compound from the annual Appendix IX monitoring requirement. Such a justification must contain the results from Appendix IX analyses from representative samples of applied waste.

b. If the Permittee finds Appendix IX constituents in the groundwater that are not identified in the permit as hazardous constituents, the Permittee must report the concentrations of these additional constituents to the Department within seven days after the date the Permittee or a representative of the Permittee receives the analytical results.

3. The compliance period is the number of years equal to the active life of the Land Treatment Unit (including any waste management activity prior to permitting, and the closure period).

a. The compliance period begins at the time the second successive sampling results show significant indications of contamination as described in Condition E.4.f of this Module.

b. If the Permittee is engaged in a corrective action program at the end of the compliance period, the compliance period is extended until the Permittee can demonstrate that the groundwater protection standard of Condition C of this Module has not been exceeded for a period of three consecutive years.

4. The Department may modify, change, add, or delete any specific parameters with the addition of waste not already in

place at the site, and in order to meet the criteria of 40 CFR 264 as incorporated by reference in ARM 16.44.702.

5. An analysis for volatile hazardous constituents shall be conducted around each contaminated well or regulated unit if determined by the Department. The Department may also require monitoring of hazardous constituents in wastes, leachate or suspected source of contamination, to determine whether contaminants entering groundwater are reasonably expected to derive from the unit in question.

6. The Permittee shall submit to the Department either a corrective action feasibility plan or variance application with complete supporting data for each hazardous constituent found in groundwater within 180 days after a statistically significant increase in the hazardous constituent(s) is detected in the groundwater.

7. If any land treatment area within the regulated unit as defined in Condition A.4. of this Module is determined to be the source of hazardous constituents in groundwater, it shall be closed, repaired or otherwise managed in accordance with any relevant specific conditions of this permit for a unit requiring actions in the event of groundwater contamination.

8. The Permittee shall submit to the Department within 90 days from initiation of the compliance monitoring program, an interim information report of groundwater analysis and all other information collected or proposed to be collected to identify the source of contaminants and extent of release in groundwater, and any proposed alternate concentration limits.

   a. The Department may accept, reject, or modify any part of the proposed information collection procedures, based on

the technical adequacy of the proposals, in complying with the requirements of 40 CFR 264.99(i)(2) as incorporated by reference in ARM 16.44.702.

b. The Permittee must ensure that monitoring and corrective action measures necessary to achieve compliance with the groundwater protection standard are taken during the compliance monitoring period.

c. If it is determined by the Department that the source of groundwater contamination is limited to the area downqradient from the Surface Impoundment identified in Permit Condition II.A., the Permittee may restrict Compliance Monitoring program for the Land Treatment Unit to include only wells that are down gradient from the Surface Impoundment. At the time of Permit issuance, those wells are 46, 47, 48 and 49. The Permittee shall monitor the remaining wells identified in Condition A.4. of this Module in accordance with a program established by the Department.

9. The Department may require any additional field tests, monitoring well installation, or further analytical tests necessary to adequately assess the horizontal and vertical rate and extent of migration of the contaminants, including the unsaturated zone routes of migration.

10. The Permittee must ensure that monitoring and corrective action measures necessary to achieve compliance with the groundwater protection standard are taken during the compliance monitoring period.

11. The Permittee must determine whether there is a statistically significant increase over the critical level for any

hazardous constituents each time the Permittee determines the concentration of hazardous constituents in the groundwater or surface water. A statistically significant increase shall be determined as follows:

a. If a hazardous constituent is detected in the groundwater that showed no concentration of that constituent in the previous sampling event, a statistically significant increase for that constituent shall be any value greater than the critical limit for that constituent as defined in Condition D.1. of this Module,

b. If a hazardous constituent is detected in a monitoring well that had measured concentrations of that parameter in previous sampling events, a statistically significant increase for that parameter shall be any value greater than that value determined to be the upper tolerance limit of the previous concentration as calculated using the procedure outlined in Attachment IV.LT.10. or using an alternative statistical test approved by the Department after permit issuance.

12. The Permittee shall comply with 40 CFR 264.97(g) as incorporated by reference in ARM 16.44.702 in developing a data base for determining background values for any new units and expressing background values in a form necessary for the determination of statistically significant increases under 40 CFR 264.97(g) as incorporated by reference in ARM 16.44.702. The Permittee shall use a groundwater monitoring system as set forth in 40 CFR 264.97(a)(1), (b) and (c) as incorporated by reference in ARM 16.44.702, and according to the terms of this permit.

13. The Permittee shall determine the groundwater surface elevation on a quarterly basis in all wells listed under Condition A.4. of this Module unless otherwise instructed by the Department. The Permittee shall continue to determine the groundwater flow rate and direction in the uppermost aquifer on a quarterly basis and submit a summary report during the first quarter of each calendar year.

14. The Department will establish the groundwater protection standard under Condition C. of this Module, such that if a "Groundwater Protection Constituent" is identified and the difference between the respective concentration limit listed in Attachment IV.LT.2. and the background value of that constituent is not statistically significant, the background value of the constituent will be used as the concentration limit.

15. The Permittee shall determine whether there is a statistically significant increase over critical levels established for each hazardous constituent under Condition F.11. of this Module each time the concentration of hazardous constituent(s) is determined at a monitoring well.

16. If the Permittee determines that there has been a statistically significant increase under Condition F.11. of this Module for any hazardous constituent at any monitoring well he or she shall:

    a. notify the Department of this finding in writing within seven days. The notification shall indicate which critical levels have been exceeded;

    b. submit to the Department for approval, within 90 days, a report addressing the finding that includes:

i. a discussion of possible causes of the increase, and

ii. a detailed description of how the corrective action plan will be modified to achieve compliance with the groundwater protection standard specified in Condition C of this Module, and a plan for a groundwater monitoring program that will demonstrate the effectiveness of the modified plan, or

iii. justification for continued implementation of the corrective action plan already in place without modification.

17. The Permittee may demonstrate that a source other than the regulated unit under these permit requirements caused the increase beyond the groundwater protection standard, including increases resulting from sampling, analytical or evaluation error. While the Permittee may make a demonstration in addition to, or in lieu of, submitting a plan approval modification application under Condition E.4.h. of this Module, he or she is not relieved of the requirement to submit a plan approval modification application within the time specified, unless the demonstration made under this paragraph successfully shows that a source other than the Land Treatment Unit caused the increase.

In making a demonstration under this paragraph, the Permittee shall:

a. notify the Department in writing in seven days that he or she intends to make a demonstration under this paragraph;

b. within 90 days, submit a report to the Department which demonstrates that a source other than a regulated unit under these provisions caused the standard to be exceeded;

c. within 90 days, submit to the Department an application for a plan approval modification and permit modification to make any appropriate changes to the compliance monitoring program at the facility; and

d. continue to monitor in accordance with the compliance monitoring program established under this section, for the waste management area in question.

18. If the Permittee determines that the compliance monitoring program no longer satisfies the requirements of this section, he or she shall, within 90 days, submit an application for a plan approval and permit modification to make any appropriate changes to the program.

19. Throughout the Compliance Monitoring Program, the Permittee shall report information required in this section:

a. On a quarterly basis, the Permittee shall report the following information in accordance with Condition D.8.e. of this Module:

i. the analytical results for all constituents required under Condition F.1. of this Module.

ii. any hazardous constituents not required under Condition F.1. of this Module but detected during analysis,

iii. Analytical methods used, including method number references;

iv. Practical quantitation limits (PQLs) for every parameter tested;

v. Quality control information pertinent to analysis involved (spikes, duplicates, blanks, etc.) including acceptance limits for spikes;

vi. Laboratory used;

vii. Data sheets provided by the laboratory;

viii. Method detection limits (MDL) for every parameter tested;

ix. Low-level groundwater data shall be reported as follows:

Analyte Concentration	Report
<MDL	Not detected (Give MDL value)
≥MDL but <PQL	Found but not quantified
≥PQL	Numerical value reported

x. PQLs for volatile organic compounds in groundwater by SW-846, Method 8020 may be no more than ten times the method detection limits given in Table 1 of the method. Analytical results shall be reported in the format given in Condition vii. above.

xi. PQLs for Polycyclic Aromatic Hydrocarbons (PAHs) by SW-846, Method 8310 may not exceed 10 µg/l for naphthalene, acenaphthene, and acenaphthylene or 10

times the MDLs given in Table 1 for the remaining 12 PAHs. Analytical results shall be reported in the format given in Condition viii. above.

xii. The Permittee shall submit to the Department the Quality Assurance Plan and the name of a contact person for each analytical laboratory which they use.

xiii. For all mass spectroscopy analyses, positive identification and quantitation is required for the compounds listed in the method. Tentative identification and estimated concentrations must be reported for all other compounds observed in the extract.

xiv. a determination whether there has been a statistically significant increase as defined in Condition F.11. of this Module.

xv.. information required under Condition F.16 of this Module in the event the Permittee determines that there has been a statistically significant increase under Condition F.11. of this Module.

b. All analyses must be achieved through the use of analytical methods recommended in Attachment IV.LT.3. unless otherwise specified by the Department.

c. Refer to Attachments IV.LT.8., IV.LT.9., and IV.LT.11. for specific reporting requirements for analysis by HPLC, GC/PID, and GC/MS. Completed data sheets from the Attachments shall be submitted for one sample per sampling event. Should the Permittee change laboratories, completed forms will be required for all

samples from the first sampling event and one sample afterwards.

d. An annual report shall be submitted during the first quarter of every calendar year that includes the following:

i. static water level measurements taken at all wells at the site throughout the year shall be tabulated and summarized as four potentiometric maps showing top of the water table for each quarter,

ii. quarterly sampling results shall be summarized and submitted to the Department along with appropriate QA/QC data,

iii. updated measurements of total depth for each well identified in Condition A.4. of this Module.

e. If the Permittee finds Appendix IX constituents in the groundwater that are not identified under the Groundwater Protection Standard, the Permittee must report the concentrations of these constituents to the Department within seven days of the date of the Permittee or a representative of the Permittee having received the analysis.

G. CORRECTIVE ACTION REQUIREMENTS

1. If the Permittee is required to establish a corrective action program under this section, he or she shall take corrective action to ensure that the regulated unit under these requirements is in compliance with the groundwater protection standard under Condition C of this Module. The Department

will specify the groundwater protection standard requirements in the facility plan approval and permit modification including:

a. a list of hazardous constituents identified under Condition E.1. of this Module;

b. concentration limits for each of those hazardous constituents;

c. the compliance point(s) under Condition A.4. of this Module; and

d. the compliance period under Condition F.3. of this Module.

2. The Permittee shall implement a corrective action program that prevents hazardous constituents from exceeding their respective concentration limits at the compliance point(s) by removing the hazardous constituents or treating them in place. The plan approval will list the specific measures which shall be taken.

3. The Permittee shall begin corrective action within a reasonable time period after the groundwater standard has been reported to have been exceeded. The Department will specify the time period in the facility plan approval. If a facility plan includes a corrective action program in addition to a compliance monitoring program, the plan approval shall specify when the corrective action will begin and such a requirement shall operate in lieu of 40 CFR 264.99(i)(2) as incorporated by reference in ARM 16.44.702.

4. In conjunction with a corrective action program, the Permittee shall establish and implement a groundwater monitoring program to demonstrate the effectiveness of the corrective action program. Such a monitoring program may be based on the requirements for a compliance monitoring program under 40 CFR 264.99 as incorporated by reference in ARM 16.44.702 and Condition F. of this Module.

5. Corrective action measures under this permit may be terminated once the concentration of hazardous constituents under 40 CFR 264.93 as incorporated by reference in ARM 16.44.702 and Condition F. of this Module meet the criteria of Condition C. of this Module for a period of three consecutive years.

6. The Permittee shall continue corrective action measures during and beyond the compliance period for as long as necessary to achieve compliance with the groundwater protection standard.

7. The Permittee shall report semi-annually in writing to the Department on the effectiveness of the corrective action program.

8. If the Permittee determines that the corrective action is no longer needed or no longer satisfies the requirements of this section,he or she shall, within 90 days, submit an application for plan approval and permit modification to the Department.

9. The Permittee shall institute corrective action as necessary to protect human health and the environment for all releases of hazardous waste or constituents from any land treatment area at the regulated unit, regardless of the time at which

the waste was applied in such unit. This requirement shall pertain for the life of the permit and through the closure/post-closure period for all regulated units at the facility.

H. CLOSURE/POST-CLOSURE

1. Closure Period

a. During the closure period the Permittee shall:

i. continue groundwater monitoring in compliance with Condition E. of this Module, or

ii. If the regulated unit is in compliance monitoring at the time of closure, continue groundwater monitoring as specified in Condition F. of this Module, or

iii. If the Permittee is engaged in a corrective action program at the beginning of closure, the Permittee shall continue groundwater monitoring in compliance with Condition F. of this Module and comply with the corrective action program requirements specified in Condition G. of this Module.

b. If any land treatment area of the regulated unit identified in Condition II.A.3. of the Permit undergoes closure or post-closure while other areas of the same unit remain in operation or closure:

i. All groundwater monitoring wells identified in Condition A.4. of this Module shall continue to monitor both closed and operating sectors of the Land Treatment Unit.

ii. The entire Land Treatment Unit shall be considered an "operating unit" for groundwater monitoring purposes and shall comply with all conditions of this Module.

iii. The Permittee shall consider both closed and operating areas of the Land Treatment Unit as potential sources for contaminant migration in the event of detection of hazardous constituents in any monitoring well identified in Condition A.4. of this Module.

iv. Corrective action requirements in Condition G. of this Module shall apply to the entire Land Treatment Unit.

2. Land Treatment Post-Closure

a. Post-closure care for all of the Land Treatment Unit must begin after completion of closure for all sectors of the Land Treatment Unit under Permit Condition III.LT.O. and must:

i. Maintain detection monitoring in compliance with Condition E. of this Module for a period of 30 years, or

ii. If the Permittee is conducting a corrective action plan at the end of the closure period, then the corrective action must be continued for as long as necessary to achieve compliance with the Groundwater Protection Standard. Corrective action measures extend into post-closure period may be terminated if the Permittee can demonstrate that the Groundwater

Protection Standard has not been exceeded for a period of three consecutive years. Following the three year period in which the Groundwater Protection Standard has not been exceeded, the Permittee must then monitor the post-closure for a period of 30 years.

b. The Department may modify post-closure monitoring and reporting requirements in the following ways:

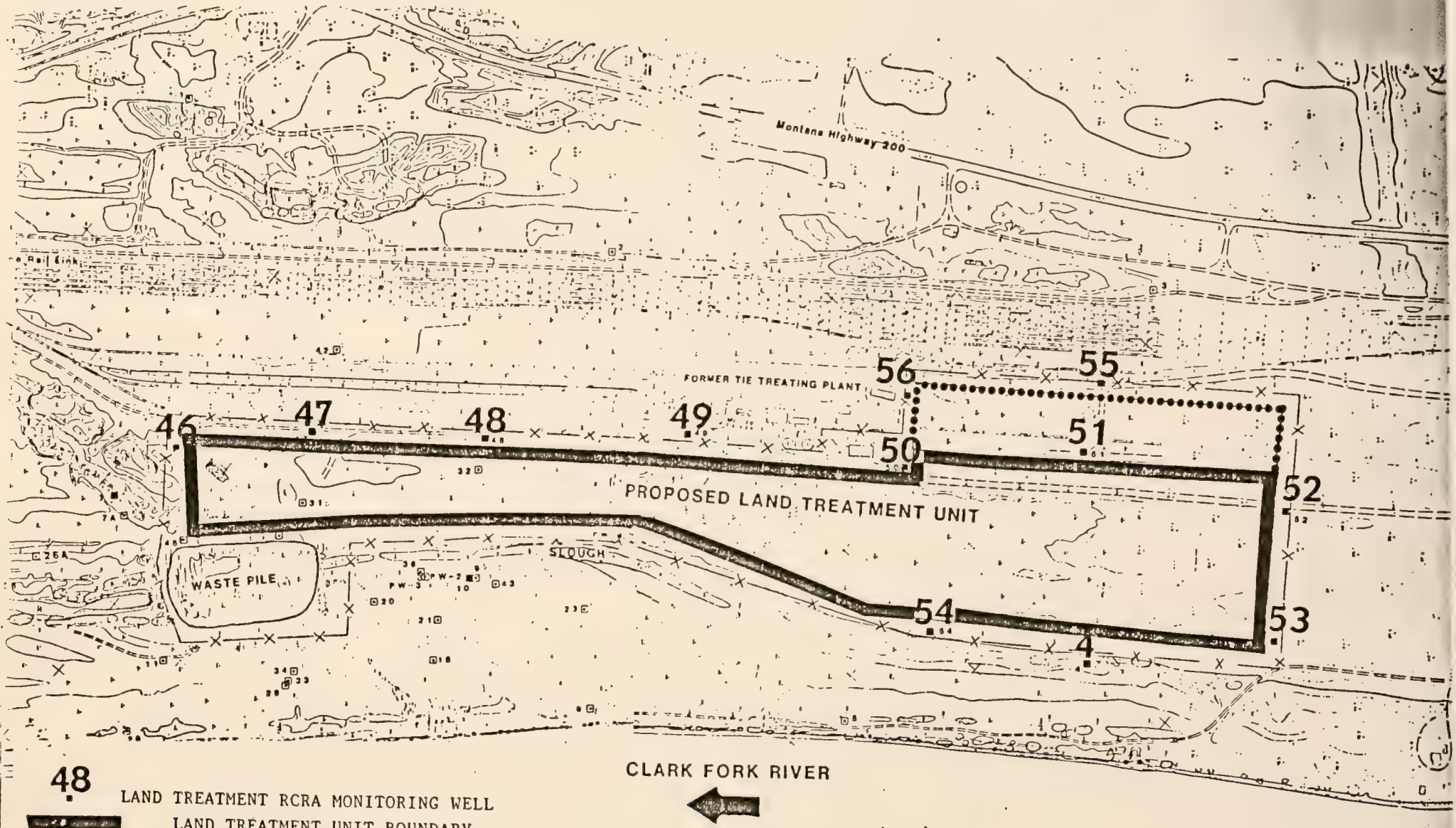
i. shorten the post-closure period,

ii. lengthen the post-closure period,

iii. change the list of parameters

iv. change the frequency of sampling events.

IV.LT.1. Map Showing Regulated Unit and Monitoring Well Locations



48 LAND TREATMENT RCRA MONITORING WELL

LAND TREATMENT UNIT BOUNDARY

PROPOSED ADDITION

LOCATION OF ADDITIONAL MONITORING WELL

IV.LT.2. Maximum Concentrations of Constituents for Groundwater Protection

Attachment IV.LT.2.

MAXIMUM CONCENTRATION OF CONSTITUENTS
FOR
GROUNDWATER PROTECTION

Constituent	Maximum Concentration (MCL) *
Arsenic	0.05
Barium	1.00
Cadmium	0.01
Chromium	0.05
Lead	0.05
Mercury	0.002
Selenium	0.01
Silver	0.05
Endrin (1,2,3,4,10,10-hexachloro-1,7-epoxy-1,4,4a,5,6,7,8,9a-octaydro-1, 4-endo, endo-5,8-dimenthano naphthalene)	0.0002
Lindane (1,2,3,4,5,6-hexachlorocyclohexane, gamma isomer)	0.004
Methoxychlor (1,1,1-Trichloro-2,2-bis (p-methoxyphenylethane)	0.1
Toxaphene ($C_{10}H_{10}C_6$, Technical chlorinated camphene, 67-69 percent chlorine)	0.005
2,4-D (2,4-Dichlorophenoxyacetic acid)	0.1
2,4,5-TP Silvex (2,3,5-Trichlorophenoxypropionic acid)	0.01

* Milligrams per liter

IV.LT.3a. Principal Hazardous Constituents
IV.LT.3b. Water Quality Indicator Parameters

ATTACHMENT IV.LT.3a.

PRINCIPAL HAZARDOUS CONSTITUENTS FOR THE BN PARADISE LAND TREATMENT UNIT GROUNDWATER MONITORING MODULE

PARAMETER	SW-846 analytical method	Critical level (ug/l)
Volatiles		
ethylbenzene	8020	2
toluene	8020	2
xylenes (m,o,p)	8020	5
Polycyclic Aromatic Hydrocarbons		
naphthalene	8310	10
acenaphthene	8310	10
acenaphthylene	8310	10
fluorene	8310	2.1
phenanthrene	8310	6.4
anthracene	8310	6.6
fluoranthene	8310	2.1
pyrene	8310	2.7
benzo(a)anthracene	8310	.13
chrysene	8310	1.5
benzo(b)fluoranthene	8310	.18
benzo(k)fluoranthene	8310	.17
benzo(a)pyrene	8310	.23
benzo(g,h,i)perylene	8310	.76
dibenzo(a,h)anthracene	8310	.30
indeno(1,2,3-cd)pyrene	8310	.43
metals		
arsenic	7060,7061	50
lead	7421,6010	50

ATTACHMENT IV.LT.3b.

WATER QUALITY INDICATOR PARAMETERS

PARAMETER
pH
specific conductance
total iron (monitor annually)
benzene extractables

IV.LT.4. Appendix IX Compounds

Federal Register

Thursday
July 9, 1987

Part II

Environmental Protection Agency

40 CFR Parts 264 and 270

List (Phase 1) of Hazardous Constituents for Ground-Water Monitoring; Final Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 264 and 270

[FRL 3199-3]

List (Phase 1) of Hazardous Constituents for Ground-Water Monitoring

AGENCY: U.S. Environmental Protection Agency.

ACTION: Final rule.

SUMMARY: The Environmental Protection Agency is today amending its regulations concerning gound-water monitoring with regard to screening suspected contamination at land based hazardous waste treatment, storage, and disposal facilities. The amendments replace current requirements to analyze for all Appendix VIII constituents with new requirements to analyze for a specified core list of chemicals plus those chemicals specified by the Regional Administrator on a site-specific basis. The Agency proposed today's amendments on July 24, 1986.

DATES: These final regulations become effective on September 28, 1987 which is six months from the date of promulgation, as RCRA Section 3010(b) requires.

ADDRESSES: The official record for this rulemaking (Docket No. F-87-AX9F-FFFFF) is located in the Room MLG100, U.S. Environmental Protection Agency, 401 M Street SW., Washington, DC 20460, and is available for viewing from 9:00 a.m. to 4:00 p.m., Monday through Friday, excluding legal holidays. Call (202) 475-9327 for appointments. The public may copy a maximum of 50 pages of material from any one regulatory docket at no cost. Additional copies cost $.20/page.

FOR FURTHER INFORMATION CONTACT: For general information about this rulemaking contact the RCRA Hotline, Office of Solid Waste (WH-562), U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460 (800) 424-9346 (toll free) or (202) 382-3000 in the Washington, D.C. metropolitan area.

For information on specific aspects of this rule contact: Jerry R. Carman, Office of Solid Waste (WH-563E), U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460 (202) 382-4658.

SUPPLEMENTARY INFORMATION:

Preamble Outline

I. Authority
II. Summary of Today's Final Rule
III. Background
A. Regulatory Framework
B. Origin of Today's Final Rule
IV. Issues Discussed in Proposed Rule
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B. Dioxin
C. Ground-Water Chemistry
D. Discretionary Additions
E. Ordering of Appendix IX
F. Representatives of Categories
V. Analytical Methods
VI. Nature of List
VII. State Authority
A. Applicability of Rules in Authorized States
B. Effect on State Authorization
VIII. Effective Date
IX. Executive Order No. 12291 and Regulatory Impact Analysis
X. Regulatory Flexibility Act
XI. Supporting Documents
XII. List of Subjects in 40 CFR Part 264 and 270

I. Authority

These regulations are being promulgated under the authority of Sections 2002(a), 3001, 3004, and 3005 of the Solid Waste Disposal Act, as amended, 42 U.S.C. 6912, 6921, 6924, and 6925 (commonly referred to as RCRA).

II. Summary of Today's Final Rule

Today's rule creates a new list of analytes for RCRA: Appendix IX to 40 CFR Part 264. This list is required only for ground-water monitoring at RCRA land based hazardous waste disposal units. This final rule, in concert with the regulations already in place, will require that an analysis of all the constituents in Appendix IX to Part 264 be performed on the ground water taken from wells surrounding those units. This analysis takes place when ground-water contamination is first detected, and then again once per year (see 40 CFR Part 264, Subpart F).

III. Background

A. Regulatory Framework

Subtitle C of the Resource Conservation and Recovery Act of 1976 (RCRA) creates a comprehensive program for the safe management of hazardous waste. Section 3004 of RCRA requires owners and operators of facilities that treat, store, or dispose of hazardous waste to comply with standards established by EPA that are "necessary to protect human health and the environment." Section 3005 provides that owners and operators of certain facilities that apply for a permit and comply with applicable notice requirements may operate until a permit determination is made. Facilities in this category are said to be operating under "interim status". Owners and operators of interim status facilities also must comply with standards set under Section 3004.

EPA promulgated standards for protecting ground water from releases of hazardous wastes from treatment, storage, and disposal units at interim status facilities in 1980 (45 FR 33154 (May 19, 1980)), codified in 40 CFR Part 265, Subpart F, and permitted facilities in 1982 (47 FR 32274 (July 26, 1982)), codified in 40 CFR Part 264, Subpart F. Both programs require owners and operators to sample ground water at specified intervals to determine whether or not hazardous wastes or constituents from the facility are contaminating ground water. As explained in more detail below, these sampling procedures have generated criticism.

The regulations promulgated on May 19, 1980 set forth criteria for identifying "hazardous" waste. To assist in this identification process, EPA developed a list of chemicals ". . . . that have been shown in reputable scientific studies to have toxic, carcinogenic, mutagenic, or teratogenic effects on humans or other life forms . . . ." (45 FR 33107, May 19, 1980). This list was published as Appendix VIII to Part 261 of the regulations.

The Appendix VIII list is actually a composite of several other lists. It includes chemicals identified as priority pollutants under the Clean Water Act, chemicals identified by the Department of Transportation as hazardous to transport, chemicals for which EPA's Carcinogen Assessment Group (CAG) has laboratory evidence of carcinogenicity, and chemicals which the NIOSH Registry of Toxic Effects of Chemical Substances lists as having high acute toxicity (numerically low LD_{50}).

The principal purpose of the list is to define a universe of chemicals of concern. Wastes would be matched against the list to see if they contained any chemicals from this universe. If so, they would be considered for listing as "hazardous".

Appendix VIII deliberately included many listings that are large categories of chemicals. Chemicals were listed on Appendix VIII as they would exist in a pure state, as opposed to the forms they would be expected to take after being dispersed in the environment. For waste identification purposes these characteristics of Appendix VIII may not present a problem. In looking for hazardous waste, EPA emphasized breadth of coverage. No attempt was made to examine factors such as amount of production or environmental fate in compiling Appendix VIII, although the hazardous waste listing regulations require EPA to consider such factors before listing a waste because it

contains an Appendix VIII chemical (see 40 CFR 261.11(a)(3)). As a result, Appendix VIII contains both prevalent, mobile, and toxic chemicals that present major risks in ground water at hazardous waste sites (e.g., trichloroethylene), as well as chemicals which do not present such risks (e.g., aflatoxins) because of factors such as low prevalence or instability in water.

On July 26, 1982, EPA promulgated RCRA regulations that implemented a strategy for ground-water protection for land-based hazardous waste management units operating under RCRA permits. Once ground-water contamination is suspected, the strategy requires an analysis to determine the nature of the contamination. This information is used to assess the problem, determine the appropriate remedy, determine when the remedy is effective, and insure that no new problems arise during the time the remedy is being applied. In an attempt to be comprehensive, the regulations required that contaminated ground water be analyzed for all constituents contained in Appendix VIII to Part 261.

While appropriate for hazardous waste listing purposes, the Appendix VIII list has presented a number of problems when used for purposes of ground-water monitoring. These include practical analytical problems such as listings which are large categories of chemicals, the dissociation or actual decomposition of many Appendix VIII constituents when placed in water, and the lack of analytical standards or analytical screening methods for many constituents.

EPA has been aware of potential analytical problems with "Appendix VIII analysis" for some time. At the time of promulgation of the 1982 regulations, EPA acknowledged that it lacked analytical methods for nine of the Appendix VIII constituents (see 47 FR 32296, July 26, 1982). When owners and operators of hazardous waste facilities began to attempt Appendix VIII analyses, however, EPA learned that analysis would be extremely difficult or impossible for a larger number of constituents.

EPA took several actions intended to mitigate the problems. For example, EPA recommended the use of enforcement discretion for some of the most intractable problems it had identified at the time. Also, in 1984, EPA proposed to eliminate 22 Appendix VIII constituents from the ground-water analysis requirements (see 49 FR 38786, October 1, 1984).

Comments on the October 1984 proposal raised questions about a number of additional analytical problems. Also, EPA gathered further information from interactions between RCRA permitting authorities, RCRA facility owners and operators, and analytical laboratories. EPA's own experience with ground-water analyses for its ground-water monitoring task force and its analytical methods development work confirmed many of these problems. These experiences demonstrated to EPA that analytical problems with Appendix VIII were far more serious than previously believed. It became clear that a major change was required.

B. Origin of Today's Final Rule

In response to this need, EPA convened a meeting on December 10–13, 1985, of some 30 technical experts representing EPA and State offices and laboratories. Many of these experts had advanced degrees in chemistry and/or substantial laboratory experience. Over four days, they evaluated all of Appendix VIII with regard to the feasibility of analysis of the various constituents. They identified a list of specific chemicals, derived from Appendix VIII, which they considered generally suitable for ground-water analyses at all facilities. They recommended that 25 chemicals, routinely analyzed in ground water by the Superfund office, be added to the list for analysis.

The results of this meeting, and subsequent work by the Agency, were summarized in a Notice of Proposed Rulemaking on July 24, 1986 (see 40 CFR 26632). Today, EPA is finalizing that proposal. The reasoning behind the final rule is the same as that discussed in the proposal. Appendix IX to Part 264 is made up of those compounds on Appendix VIII to Part 261 for which it is feasible to analyze in ground-water samples, plus 17 chemicals routinely monitored in the Superfund program.

Fifteen of the 17 chemical entities included from the Superfund program are organic chemicals, the other 2 (tin and cobalt) are metals. These 17 exhibit varying, but significant, degrees of toxicity. All of them have the potential to adversely effect human health or the environment, and are therefore of value for monitoring at RCRA facilities. The docket for this rulemaking contains information, or references to publicly available information, that demonstrates the toxic or hazardous potential of these Superfund additions.

One of the Superfund compounds (benzoic acid) which was on the proposed Appendix IX is not on the final Appendix IX because there is currently no acceptable screening method for it. Benzoic acid requires a derivatization before it will yield itself to gas chromotographic analysis. The rest of the Superfund additions to Appendix IX are readily amenable to analysis.

The other 7 Superfund items that were a part of the proposed Appendix IX are not a part of the final Appendix. They are relatively non-toxic inorganics. These are addressed below under "Ground Water Chemistry".

The majority of the data evaluated for this rule are contained in background documents for the July 24, 1986, Proposed Rulemaking. However, during the public comment period of this proposed rulemaking, EPA received more data concerning the feasibility of analyzing certain Appendix VIII constituents in ground water. This data was evaluated on December 11, 1986, at a meeting of analytical experts. A list of the attendees of this meeting, the new data received by EPA since the proposal, and the group's decision concerning the feasibility of analysis, are contained in background documentation for this rule.

IV. Issues Discussed in Proposed Rule

In addition to solicitating comment on EPA's overall approach, the July 24, 1986 Notice of Proposed Rulemaking, raised six specific issues for comment. The following is a brief description of these issues, the comments received on each, and the Agency's response to those comments.

A. Borderline Chemicals

In the July 24, 1986 proposal EPA listed 48 chemicals for which the Agency had conflicting data pertaining to their analytical feasibility. A few commentors supplied new data or an opinion about these compounds. The new data was evaluated at the aforementioned December 11, 1986 meeting of analytical experts. A decision was made as to whether or not each chemical belonged on the final Appendix IX based on the criteria discussed in the proposal (see 51 FR 26635–36). In sum, five of the compounds not on the proposed Appendix IX, but listed as borderline, have been added to the final Appendix IX because it was determined that they were amendable to the analytical screening methodologies. Likewise, thirteen of the borderline chemicals that were on the proposed Appendix IX have been removed from the final list because new data had demonstrated that they were not suitable for screening analysis. The background documentation for this final rule elaborates upon these decisions.

B. Dioxin

Although, the proposed Appendix IX contained polychlorinated dibenzo-p-dioxins, the proposed rulemaking questioned whether requiring the analysis of these dioxins presents a human health or environmental risk in itself. Several of the comments EPA received during the public comment period agreed that requiring these analyses did pose a threat to human health or the environment. However, none of the commentors supplied any new data concerning this issue. Therefore, given that dioxin analyses are currently performed in a number of laboratories with seemingly little adverse effects, and that numerous other highly toxic chemicals are commonly worked within laboratories, the Agency has concluded that requiring dioxin analysis probably does not constitute a significant environmental hazard in itself. Therefore, since it is feasible to analyze for these dioxins in ground water, they remain on Appendix IX. It should also be noted that many commentors thought that dioxins should not be on Appendix IX because they are rarely, if ever, found in ground water.

C. Ground-Water Chemistry

In the July 24, 1986 proposal, EPA discussed the presence of some constituents on the proposed Appendix IX that were generally non-toxic. These chemical species were either derived from Appendix VIII (e.g., sodium from sodium cyanide) or were part of the Superfund additions. The Agency proposed to include these species on Appendix IX because their analyses provides information on ground-water chemistry and movement. Many commentors argued that such constituents should not be included on Appendix IX if they do not pose a significant hazard. The Agency agrees with these commentors on this issue and has deleted these constituents from Appendix IX. The following table contains those constituents that, while not part of Appendix IX, are valuable for the characterization of subsurface environmental chemistry. It is important to note that while these constituents are unlikely to pose a significant hazard in themselves, the Regional Administrator does have the authority to require monitoring for them on a case-by-case basis if such analyses are necessary to protect human health and the environment (see "Discretionary Additions", below).

TABLE I

Aluminum	Fluoride	Potassium
Bicarbonate/ Carbonate	Hydrogen Ion (pH)	Silica
Boron	Iron	Sodium
Calcium	Magnesium	Strontium
Chloride	Manganese	Sulfate
	Nitrate	

The constituents in Table I are provided to aid in the evaluation of ground-water quality beneath a hazardous waste facility. Two important reasons for evaluating ground-water quality are: (1) to detect changes in the geochemistry at the facility and (2) to understand the local ground-water chemical environment.

Significant changes from the natural concentration of Table I constituents may indicate the escape of contaminants from the facility. Ground water is frequently classified by the relative abundance of dominant ions (Na^+, Mg^{2+}, Ca^{2+}, Cl^-, HCO_3^-, CO_3^{2-}, SO_4^{2-}, and K^+). Concentrations that differ significantly from normal concentrations in the aquifer can signal chemical equilibrium shifts brought about by the interaction of contaminants and natural constituents. Such interaction may also generate new compounds. In some instances, the detection of concentration changes of the more mobile ions (e.g., Cl^-) may suggest that less mobile contaminants have entered the aquifer closer to the regulated unit. Concentration changes in other Table 1 constituents, such as nitrate, may be controlled by biochemical processes acting on subsurface contaminants.

The local ground-water chemistry may affect contaminant transport by modifying both the solubility of the Appendix IX constituents and the relevant concentration gradients. The solubility of a particular constituent is influenced by several parameters: temperature, pressure, pH, oxidation-reduction potential (Eh), and the concentration of other constituents. Iron and magnesium, which naturally occur in ground-waters, may cause otherwise low mobility organic substances to move more freely. The bicarbonate/carbonate system frequently regulates the pH of ground-water, and thus the solubility of contaminants.

Chemical concentration gradients, which may be determined partly by natural chemistry, become more important when ground-water velocities are low. The dispersion of contaminants in directions transverse to the ground-water flow path may be governed by prevailing concentration gradients.

D. Discretionary Additions

EPA currently has the authority under 40 CFR 270.32(b)(2) and Section 3005(c)(3) of RCRA as amended in 1984, to require the analysis of chemicals outside Appendix IX where necessary to protect human health and the environment. In the July 24, 1986 proposal, an option to make the authority explicit in the Part 264 regulations was noted for public comment. A number of commentors expressed the opinion that site-specific additions to Appendix IX were acceptable if a suitable analytical method existed. The few commentors that directly addressed the issue of explicit authority were almost equally divided in their opinion on whether or not the authority should be made more explicit. EPA has decided that the above authorities for site-specific analyses are sufficient at this time to require additional analyses of chemicals outside of Appendix IX.

E. Ordering of Appendix IX

The proposed Appendix IX was alphabetically ordered by systematic name. The Agency solicited comment on how the final list should be ordered. Of those organizations that commented on this issue, half desired ordering by systematic name, and half by common name. EPA has decided to order the list by alphabetic common name, in keeping with the form often used in other Agency lists. Appendix IX also contains the Chemical Abstract Service registry number and the Chemical Abstract Service index name.

F. Representatives of Categories

In making the transition from Appendix VIII of Part 261 to Appendix IX of Part 264, EPA selected specific chemicals for inclusion on Appendix IX to replace the listings of categories of Appendix VIII. While few commentors addressed the listing of the specific chemical for this reason, in general, the comments EPA received were quite supportive of the Agency's decision on this issue. EPA stands by this earlier decision. The final Appendix IX contains a number of chemicals that, while not specifically included on Appendix VIII, are members of categories that are contained on that list.

V. Analytical Methods

The fundamental concern of EPA in the formulation of Appendix IX was that all the constituents on the list be readily amenable to EPA's standard analytical methods for screening, i.e., methods that determine whether hazardous

constituents are present in ground-water samples containing unknown amounts of unidentified chemicals. With this rule, EPA believes this goal has been met. In order to facilitate the analysis of these compounds, the Agency has included two additional columns in the regulatory list besides those columns that identify the constituent of concern. The fourth column contains some suggested methods from "Testing Methods for Evaluating Solid Waste" (SW–846). SW–846 is the general RCRA analytical methods manual that is currently in its third edition. It is important to note that some of the methods described in SW–846 are less appropriate for screening and are better suited to routine monitoring where the analyst is fairly sure which chemicals are present. Copies of the manual (order # 955–001–00000–1) are available from the U.S. Government Printing Office, Superintendent of Documents, Washington, DC 20402, (202) 783–3238. The list of suggested SW–846 methods is not part of the regulation; EPA does not require the use of these methods for Appendix IX analyses. The Agency believes that these methods will provide acceptable analytical results.

The fifth column in Appendix IX contains estimates of a practical quantitation limit for the particular constituent by a method. The "practical quantification limit" (pql) is defined in SW–846. These pql's are EPA's current best estimate of the practical sensitivity of the applicable method for RCRA ground-water monitoring purposes. It should be noted that some listed pql values may be unattainable in some situations since they were based on general estimates for the method and not on data for the specific substance. Again, this column is included for guidance purposes and is not a regulatory requirement. In some cases, due to site and sample specific factors, these limits may not be reached. However, if a laboratory finds that it has large deviations from these limits, attempts should be made to identify the causes for these discrepancies.

It should be noted that the Suggested Methods column does not contain all applicable SW–846 methods. In some circumstances, other SW–846 methods may be preferred. Where more than one method is listed, the method with the lowest pql is usually to be preferred. Alternatively, in some cases it is possible to modify a method to achieve the lowest pql for the analyte.

Because of the ongoing nature of analytical methods development, not all of the chemicals on Appendix IX are specifically addressed in SW–846. However, the Agency plans to rectify this situation in future updates to SW–846. Until that time, the fourth and fifth columns of Appendix IX should assist laboratories in performing the necessary analyses.

A background document for this rulemaking may also be of help to laboratories. The document, "Summary of Appropriate Methods for Appendix IX" lists those method(s) which are appropriate for each Appendix IX constituent, and references the applicable sections SW–846 or one of several methods development documents, as well as supplying some basic analytical data (e.g., retention time). This document is available in the docket for this rulemaking.

VI. Nature of List

EPA wishes to make it clear that Appendix IX, like other analyte lists, is a "living" list. That is, Appendix IX is likely to change over time. With the development and standardization of new technologies and methods, Appendix IX will likely require revision. Moreover, the basis for Appendix IX to Part 264 is Appendix VIII to Part 261. Changes to Appendix VIII may require modifications to Appendix IX. EPA is open, at anytime, to new data and information that may affect these decisions.

With this rule EPA completes the first phase of a two phase effort. While Appendix IX essentially solves the problem of requiring monitoring for only those constituents for which it is possible to analyze, it does not address the question of what are the most appropriate analytes for this purpose. This question will be dealt with in future rulemakings.

VII. State Authority

A. Applicability of Rules in Authorized States

Under Section 3006 of RCRA, EPA may authorize qualified States to administer and enforce the RCRA program within the State. (See 40 CFR Part 271 for the standards and requirements for authorization.) Following authorization, the Agency retains enforcement authority under Sections 3008, 7003 and 3013 of RCRA, although authorized States have primary enforcement responsibility.

Prior to the Hazardous and Solid Waste Amendments of 1984 (HSWA), a State with final authorization administered its hazardous waste program entirely in lieu of the Federal program. The Federal requirements no longer applied in the authorized State, and the Agency could not issue permits for any facilities in a State where the State was authorized to permit. When new, more stringent Federal requirements were promulgated or enacted, the State was obligated to enact equivalent authority within specified time frames. New federal requirements did not take effect in an authorized State until the State adopted the requirements as State law.

In contrast, under Section 3006(g) of RCRA, 42 U.S.C. 6926(g), new requirements and prohibitions imposed by HSWA take effect in authorized States at the same time that they take effect in nonauthorized States. The Agency is directed to carry out those requirements and prohibitions in authorized States, including the issuance of permits, until the State is granted authorization to do so. While States must still adopt HSWA-related provisions as State law to retain final authorization, the HSWA applies in authorized States in the interim.

B. Effect on State Authorization

Today's rule promulgates standards that are not effective in authorized States since the requirements are not being imposed pursuant to Hazardous and Solid Waste Amendments of 1984. Thus, the requirements will be applicable only in those States that do not have final authorization. In authorized States, the requirements will not be applicable until the State revises its program to adopt equivalent requirements under State law. Since states may always impose requirements which are more stringent or have greater coverage than EPA's programs, States will not be required to revise their regulations to reflect the deletions of constituents from the current monitoring requirements, although they may choose to do so. Regulations which are broader in scope, however, may not be enforced as part of the Federally-authorized RCRA program.

40 CFR 271.21(e)(2) requires States that have final authorization to modify their programs to reflect Federal program changes, and to subsequently submit the modification to EPA for approval. The deadline by which the State must modify its program to adopt today's rule is July 1988. These deadlines can be extended in exceptional cases (40 CFR 271.21(e)(3)). Once EPA approves the revision, the State requirements become Subtitle C RCRA requirements.

States with authorized RCRA programs may already have requirements similar to those in today's rule. These State requirements have not been assessed against the Federal

regulations being promulgated today to determine whether they meet the tests for authorization. Thus, a State is not authorized to carry out these requirements in lieu of the Agency until the State requirements are approved. Of course, States with existing standards may continue to administer and enforce their standards as a matter of State law.

States that submit official applications for final authorization less than 12 months after the effective date of these standards are not required to include standards equivalent to these standards in their application. However, the State must modify its program by the deadlines set forth in §271.21(e). States that submit official applications for final authorization 12 months after the effective date of those standards must include standards equivalent to these standards in their application. 40 CFR 271.3 sets forth the requirements a State must meet when submitting its final authorization application.

VIII. Effective Date

Pursuant to Section 3010(b) of RCRA, today's amendments will be effective six months after promulgation.

IX. Executive Order No. 12291 and Regulatory Impact Analysis

Under Executive Order 12291, the Agency must judge whether a regulation is "major" and, therefore, subject to the requirement of a Regulatory Impact Analysis. As stated in the proposed rule on July 24, 1985, the Agency does not believe these conforming changes will result in an annual effect on the economy of $100 million or more; a major increase in costs of prices of consumers, individual industries, Federal, State, or local government agencies, or geographic regions; or significant adverse effects on competition, employment, investment, productivity, innovation, or in domestic or export markets. The Agency believes that today's rule is not a major rule under Executive Order 12291 and therefore, has not prepared a Regulatory Impact Analysis (RIA). This regulation was submitted to the Office of Management and Budget for review as required by Executive Order 12291.

X. Regulatory Flexibility Act

Under the Regulatory Flexibility Act, 5 U.S.C. 601 et seq., the Agency must prepare a regulatory flexibility analysis for all regulations that may have a significant impact on a substantial number of small entities. The Agency conducted such an analysis on the land disposal regulations and published a summary of the results in the Federal Register, Vol. 48, No. 15 on January 21, 1983. Today's conforming regulation does not impose significant additional burdens. In addition, they do not impose any requirements beyond those required for permitting facilities under Part 264. Therefore, pursuant to 5 U.S.C. 601(b), I certify that this regulation will not have a significant economic impact on a substantial number of small entities.

XI. Supporting Documents

The docket (see "Addresses") for this rulemaking contains the new data EPA received concerning the analytical feasibility of these compounds since the time the proposed rule was published in the Federal Register. The docket also contains a chemical-by-chemical summary of any compounds that were re-examined since the time of the proposal, as well as a report of the aforementioned December 11, 1986 meeting of analytical experts. The background document "Summary of Appropriate Methods for Appendix IX" (see "Analytical Methods") is also available in the docket.

XII. Lists of Subjects in 40 CFR Parts 264 and 270

Hazardous materials, Reporting and Recordkeeping Requirements, Waste Treatment and Disposal, and Water Supply, Administrative Practice and Procedure, Ground Water, Environmental Monitoring.

Dated: June 19, 1987.

Lee M. Thomas,

Administrator.

For the reasons set out in the preamble, Title 40 of the Code of Federal Regulations is amended as follows:

PART 264—AMENDED

1. The authority citation for Part 264 is revised to read as follows:

Authority: Secs. 1006, 2002(a), 3001, 3004, and 3005 of the Solid Waste Disposal Act, as amended, 42 U.S.C. 6905, 6912(a), 6924 and 6925.

2. Section 264.98 is amended by revising paragraphs (h)(2), (h)(3) introductory text and (h)(4)(i) introductory text to read as follows:

§ 264.98 Detection monitoring program.

* * * * *

(h) * * *

(2) Immediately sample the ground water in all monitoring wells and determine whether constituents identified in the list in Appendix IX of Part 264 are present and, if so, at what concentration.

* * * * *

(3) Establish a background value for each constituent that has been found at the compliance point under paragraph (h)(2) of this section, as follows:

* * * * *

(4) * * *

(i) An identification of the concentration of each constituent found in the ground water at each monitoring well at the compliance point:

* * * * *

3. Section 264.99 is amended by revising paragraph (f) to read as follows:

§ 264.99 Compliance monitoring program.

* * * * *

(f) The owner or operator must analyze samples from all monitoring wells at the compliance point to determine whether constituents identified in the list in Appendix IX to Part 264 of this chapter are present and, if so, at what concentration. The analysis must be conducted at least annually to determine whether additional Appendix IX constituents are present in the uppermost aquifer. If the owner or operator finds constituents from Appendix IX in the ground water that are not already identified in the permit as monitoring constituents, the owner or operator must report the concentration of these additional constituents to the Regional Administrator within seven days after completion of the analysis.

* * * * *

Appendix VII and VIII [Reserved]

4. A new Appendix VII and Appendix VIII are added to Part 264 and reserved as follows:

Appendix VII (reserved)
Appendix VIII (reserved)

5. A new Appendix IX is added to Part 264 as follows:

APPENDIX IX—GROUND-WATER MONITORING LIST [1]

Common name [2]	CAS RN [3]	Chemical abstracts service index name [4]	Suggested methods [5]	P (µg
Acenaphthene	83-32-9	Acenaphthylene, 1,2-dihydro-	8100 8270	
Acenaphthylene	208-96-8	Acenaphthylene	8100 8270	
Acetone	67-64-1	2-Propanone	8240	
Acetophenone	98-86-2	Ethanone, 1-phenyl-	8270	
Acetonitrile; Methyl cyanide	75-05-8	Acetonitrile	8015	
2-Acetylaminofluorene; 2-AAF	53-96-3	Acetamide, N-9H-fluoren-2-yl-	8270	
Acrolein	107-02-8	2-Propenal	8030 8240	
Acrylonitrile	107-13-1	2-Propenenitrile	8030 8240	
Aldrin	309-00-2	1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro- (1α,4α,4aβ,5α,8α,8aβ)-	8080 8270	
Allyl chloride	107-05-1	1-Propene, 3-chloro-	8010 8240	
4-Aminobiphenyl	92-67-1	[1,1'-Biphenyl]-4-amine	8270	
Aniline	62-53-3	Benzenamine	8270	
Anthracene	120-12-7	Anthracene	8100 8270	
Antimony	(Total)	Antimony	6010 7040 7041	
Aramite	140-57-8	Sulfurous acid, 2-chloroethyl 2-[4-(1,1-dimethylethyl)phenoxy]-1-methylethyl ester	8270	
Arsenic	(Total)	Arsenic	6010 7060 7061	
Barium	(Total)	Barium	6010 7080	
Benzene	71-43-2	Benzene	8020 8240	
Benzo[a]anthracene; Benzanthracene	56-55-3	Benz[a]anthracene	8100 8270	
Benzo[b]fluoranthene	205-99-2	Benz[e]acephenanthrylene	8100 8270	
Benzo[k]fluoranthene	207-08-9	Benzo[k]fluoranthene	8100 8270	
Benzo[ghi]perylene	191-24-2	Benzo[ghi]perylene	8100 8270	
Benzo[a]pyrene	50-32-8	Benzo[a]pyrene	8100 8270	
Benzyl alcohol	100-51-6	Benzenemethanol	8270	
Beryllium	(Total)	Beryllium	6010 7090 7091	
alpha-BHC	319-84-6	Cyclohexane, 1,2,3,4,5,6-hexachloro-,(1α,2α,3β,4α,5β,6β)-	8080 8250	
beta-BHC	319-85-7	Cyclohexane, 1,2,3,4,5,6-hexachloro-,(1α,2β,3α,4β,5α,6β)-	8080 8250	
delta-BHC	319-86-8	Cyclohexane, 1,2,3,4,5,6-hexachloro-,(1α,2α 3α,4β,5α,6β)-	8080 8250	
gamma-BHC; Lindane	58-89-9	Cyclohexane, 1,2,3,4,5,6-hexachloro-,(1α,2α,3β,4α,5α,6β)-	8080 8250	
Bis(2-chloroethoxy)methane	111-91-1	Ethane, 1,1'-[methylenebis (oxy)]bis[2-chloro-	8270	
Bis(2-chloroethyl)ether	111-44-4	Ethane, 1,1'-oxybis[2-chloro-	8270	
Bis(2-chloro-1-methylethyl) ether; 2,2'-Dichlorodiisopropyl ether	108-60-1	Propane, 2,2'-oxybis[1-chloro-	8010 8270	
Bis(2-ethylhexyl) phthalate	117-81-7	1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl)ester	8060 8270	
Bromodichloromethane	75-27-4	Methane, bromodichloro-	8010 8240	
Bromoform; Tribromomethane	75-25-2	Methane, tribromo-	8010 8240	

APPENDIX IX—GROUND-WATER MONITORING LIST [1]—Continued

Common name [2]	CAS RN [3]	Chemical abstracts service index name [4]	Suggested methods [5]
4-Bromophenyl phenyl ether	101-55-3	Benzene, 1-bromo-4-phenoxy-	8270
Butyl benzyl phthalate; Benzyl butyl phthalate	85-68-7	1,2-Benzenedicarboxylic acid, butyl phenylmethyl ester	8060 8270
Cadmium	(Total)	Cadmium	6010 7130 7131
Carbon disulfide	75-15-0	Carbon disulfide	8240
Carbon tetrachloride	56-23-5	Methane, tetrachloro-	8010 8240
Chlordane	57-74-9	4,7-Methano-1H-indene, 1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-	8080 8250
p-Chloroaniline	106-47-8	Benzenamine, 4-chloro-	8270
Chlorobenzene	108-90-7	Benzene, chloro-	8010 8020 8240
Chlorobenzilate	510-15-6	Benzeneacetic acid, 4-chloro-α-(4-chlorophenyl)-α-hydroxy-, ethyl ester	8270
p-Chloro-m-cresol	59-50-7	Phenol, 4-chloro-3-methyl-	8040 8270
Chloroethane; Ethyl chloride	75-00-3	Ethane, chloro-	8010 8240
Chloroform	67-66-3	Methane, trichloro-	8010 8240
2-Chloronaphthalene	91-58-7	Naphthalene, 2-chloro-	8120 8270
2-Chlorophenol	95-57-8	Phenol, 2-chloro-	8040 8270
4-Chlorophenyl phenyl ether	7005-72-3	Benzene, 1-chloro-4-phenoxy-	8270
Chloroprene	126-99-8	1,3-Butadiene, 2-chloro-	8010 8240
Chromium	(Total)	Chromium	6010 7190 7191
Chrysene	218-01-9	Chrysene	8100 8270
Cobalt	(Total)	Cobalt	6010 7200 7201
Copper	(Total)	Copper	6010 7210
m-Cresol	108-39-4	Phenol, 3-methyl-	8270
o-Cresol	95-48-7	Phenol, 2-methyl-	8270
p-Cresol	106-44-5	Phenol, 4-methyl-	8270
Cyanide	57-12-5	Cyanide	9010
2,4-D; 2,4-Dichlorophenoxyacetic acid	94-75-7	Acetic acid, (2,4-dichlorophenoxy)-	8150
4,4'-DDD	72-54-8	Benzene 1,1'-(2,2-dichloroethylidene)bis[4-chloro-	8080 8270
4,4'-DDE	72-55-9	Benzene 1,1'-(dichloroethylidene)bis[4-chloro-	8080 8270
4,4'-DDT	50-29-3	Benzene 1,1'-(2,2,2-trichloroethylidene)bis[4-chloro-	8080 8270
Diallate	2303-16-4	Carbamothioic acid, bis(1-methylethyl)-, S-(2,3-dichloro-2-propenyl) ester	8270
Dibenz[a,h]anthracene	53-70-3	Dibenz[a,h]anthracene	8100 8270
Dibenzofuran	132-64-9	Dibenzofuran	8270
Dibromochloromethane; Chlorodibromomethane	124-48-1	Methane, dibromochloro-	8010 8240
1,2-Dibromo-3-chloropropane; DBCP	96-12-8	Propane, 1,2-dibromo-3-chloro-	8010 8240 8270
1,2-Dibromoethane; Ethylene dibromide	106-93-4	Ethane, 1,2-dibromo-	8010 8240
Di-n-butyl phthalate	84-74-2	1,2-Benzenedicarboxylic acid, dibutyl ester	8060 8270
o-Dichlorobenzene	95-50-1	Benzene, 1,2-dichloro-	8010 8020 8120 8270

APPENDIX IX—GROUND-WATER MONITORING LIST [1]—Continued

Common name [2]	CAS RN [3]	Chemical abstracts service index name [4]	Suggested methods [5]
m-Dichlorobenzene	541-73-1	Benzene, 1,3-dichloro-	8010 8020 8120 8270
p-Dichlorobenzene	106-46-7	Benzene, 1,4-dichloro-	8010 8020 8120 8270
3,3'-Dichlorobenzidine	91-94-1	[1,1'-Biphenyl]-4,4'-diamine, 3,3'-dichloro-	8270
trans-1,4-Dichloro-2-butene	110-57-6	2-Butene, 1,4-dichloro-, (E)-	8240
Dichlorodifluoromethane	75-71-8	Methane, dichlorodifluoro-	8010 8240
1,1-Dichloroethane	75-34-3	Ethane, 1,1-dichloro-	8010 8240
1,2-Dichloroethane; Ethylene dichloride	107-06-2	Ethane, 1,2-dichloro-	8010 8240
1,1-Dichloroethylene; Vinylidene chloride	75-35-4	Ethene, 1,1-dichloro-	8010 8240
trans-1,2-Dichloroethylene	156-60-5	Ethene, 1,2-dichloro-, (E)-	8010 8240
2,4-Dichlorophenol	120-83-2	Phenol, 2,4-dichloro-	8040 8270
2,6-Dichlorophenol	87-65-0	Phenol, 2,6-dichloro-	8270
1,2-Dichloropropane	78-87-5	Propane, 1,2-dichloro-	8010 8240
cis-1,3-Dichloropropene	10061-01-5	1-Propene, 1,3-dichloro-, (Z)-	8010 8240
1,3-Dichloropropene	10061-02-6	1-Propene, 1,3-dichloro-, (E)-	8010 8240
n	60-57-1	2,7:3,6-Dimethanonaphth[2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-, (1aα,2β,2aα,3β,6β,6aα,7β,7aα)-	8080 8270
Diethyl phthalate	84-66-2	1,2-Benzenedicarboxylic acid, diethyl ester	8060 8270
O,O-Diethyl O-2-pyrazinyl phosphorothioate; Thionazin	297-97-2	Phosphorothioic acid, O,O-diethyl O-pyrazinyl ester	8270
Dimethoate	60-51-5	Phosphorodithioic acid, O,O-dimethyl S-[2-(methylamino)-2-oxoethyl] ester	8270
p-(Dimethylamino)azobenzene	60-11-7	Benzenamine, N,N-dimethyl-4-(phenylazo)-	8270
7,12-Dimethylbenz[a]anthracene	57-97-6	Benz[a]anthracene, 7,12-dimethyl-	8270
3,3'-Dimethylbenzidine	119-93-7	[1,1'-Biphenyl]-4,4'-diamine, 3,3'-dimethyl-	8270
alpha, alpha-Dimethylphenethylamine	122-09-8	Benzeneethanamine, α,α-dimethyl-	8270
2,4-Dimethylphenol	105-67-9	Phenol, 2,4-dimethyl-	8040 8270
Dimethyl phthalate	131-11-3	1,2-Benzenedicarboxylic acid, dimethyl ester	8060 8270
m-Dinitrobenzene	99-65-0	Benzene, 1,3-dinitro-	8270
4,6-Dinitro-o-cresol	534-52-1	Phenol, 2-methyl-4,6-dinitro-	8040 8270
2,4-Dinitrophenol	51-28-5	Phenol, 2,4-dinitro-	8040 8270
2,4-Dinitrotoluene	121-14-2	Benzene, 1-methyl-2,4-dinitro-	8090 8270
2,6-Dinitrotoluene	606-20-2	Benzene, 2-methyl-1,3-dinitro-	8090 8270
Dinoseb; DNBP; 2-sec-Butyl-4,6-dinitrophenol	88-85-7	Phenol, 2-(1-methylpropyl)-4,6-dinitro-	8150 8270
Di-n-octyl phthalate	117-84-0	1,2-Benzenedicarboxylic acid, dioctyl ester	8060 8270
1,4-Dioxane	123-91-1	1,4-Dioxane	8015
Diphenylamine	122-39-4	Benzenamine, N-phenyl-	8270
Disulfoton	298-04-4	Phosphorodithioic acid, O,O-diethyl S-[2-(ethylthio)-ethyl] ester	8140 8270
Endosulfan I	959-98-8	6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-, 3-oxide, (3α,5aβ,6α,9α,9aβ)-	8080 8250

APPENDIX IX—GROUND-WATER MONITORING LIST [1]—Continued

Common name [2]	CAS RN [3]	Chemical abstracts service index name [4]	Suggested methods [5]
Endosulfan II	33213-65-9	6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-, 3-oxide, (3α,5aα,6β,9β,9aα)-	8080
Endosulfan sulfate	1031-07-8	6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-, 3,3-dioxide.	8080 8270
Endrin	72-20-8	2,7:3,6-Dimethanonaphth[2,3-b]oxirene, 3,4,5,8,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-, (1aα,2β,2aβ,3α,6α, 6aβ,7β,7aα)-	8080 8250
Endrin aldehyde	7421-93-4	1,2,4-Methenocyclopenta[cd]pentalene-5-carboxaldehyde, 2,2a,3,3,4,7-hexachlorodecahydro-, (1α,2β,2aβ,4β,4aβ,5β,6aβ,6bβ,7R*)-	8080 8270
Ethylbenzene	100-41-4	Benzene, ethyl-	8020 8240
Ethyl methacrylate	97-63-2	2-Propenoic acid, 2-methyl-, ethyl ester	8015 8240 8270
Ethyl methanesulfonate	62-50-0	Methanesulfonic acid, ethyl ester	8270
Famphur	52-85-7	Phosphorothioic acid, O-[4-[(dimethylamino)sulfonyl]phenyl]-O,O-dimethyl ester	8270
Fluoranthene	206-44-0	Fluoranthene	8100 8270
Fluorene	86-73-7	9H-Fluorene	8100 8270
Heptachlor	76-44-8	4,7-Methano-1H-indene, 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-	8080 8270
Heptachlor epoxide	1024-57-3	2,5-Methano-2H-indeno[1,2-b]oxirene, 2,3,4,5,6,7,7-heptachloro-1a,1b,5,5a,6,6a,-hexahydro-, (1aα,1bβ,2α,5α,5aβ,6β,6aα)	8080 8270
Hexachlorobenzene	118-74-1	Benzene, hexachloro-	8120 8270
Hexachlorobutadiene	87-68-3	1,3-Butadiene, 1,1,2,3,4,4-hexachloro-	8120 8270
Hexachlorocyclopentadiene	77-47-4	1,3-Cyclopentadiene, 1,2,3,4,5,5-hexachloro-	8120 8270
Hexachloroethane	67-72-1	Ethane, hexachloro-	8120 8270
Hexachlorophene	70-30-4	Phenol, 2,2'-methylenebis[3,4,6-trichloro-	8270
Hexachloropropene	1888-71-7	1-Propene, 1,1,2,3,3,3-hexachloro-	8270
2-Hexanone	591-78-6	2-Hexanone	8240
Indeno(1,2,3-cd)pyrene	193-39-5	Indeno[1,2,3-cd]pyrene	8100 8270
Isobutyl alcohol	78-83-1	1-Propanol, 2-methyl-	8015
Isodrin	465-73-6	1,4,5,8-Dimethanonaphthalene,1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a hexahydro-(1α,4α,4aβ,5β,8β,8aβ)-	8270
Isophorone	78-59-1	2-Cyclohexen-1-one, 3,5,5-trimethyl-	8090 8270
Isosafrole	120-58-1	1,3-Benzodioxole, 5-(1-propenyl)-	8270
Kepone	143-50-0	1,3,4-Metheno-2H-cyclobuta-[cd]pentalen-2-one, 1,1a,3,3a,4,5,5,5a,5b,6-decachlorooctahydro-	8270
Lead	(Total)	Lead	6010 7420 7421
Mercury	(Total)	Mercury	7470
Methacrylonitrile	126-98-7	2-Propenenitrile, 2-methyl-	8015 8240
Methapyrilene	91-80-5	1,2-Ethanediamine, N,N-dimethyl-N'-2-pyridinyl-N'-(2-thienylmethyl)-	8270
Methoxychlor	72-43-5	Benzene, 1,1'-(2,2,2,trichloroethylidene)bis[4-methoxy-	8080 8270
Methyl bromide; Bromomethane	74-83-9	Methane, bromo-	8010 8240
Methyl chloride; Chloromethane	74-87-3	Methane, chloro-	8010 8240
3-Methylcholanthrene	56-49-5	Benz[j]aceanthrylene, 1,2-dihydro-3-methyl-	8270
Methylene bromide; Dibromomethane	74-95-3	Methane, dibromo-	8010 8240
Methylene chloride; Dichloromethane	75-09-2	Methane, dichloro-	8010 8240

APPENDIX IX—GROUND-WATER MONITORING LIST [1]—Continued

Common name [2]	CAS RN [3]	Chemical abstracts service index name [4]	Suggested methods [5]	PQL
Methyl ethyl ketone; MEK	78-93-3	2-Butanone	8015	
			8240	
Methyl iodide; Iodomethane	74-88-4	Methane, iodo-	8010	
			8240	
Methyl methacrylate	80-62-6	2-Propenoic acid, 2-methyl-, methyl ester	8015	
			8240	
Methyl methanesulfonate	66-27-3	Methanesulfonic acid, methyl ester	8270	
2-Methylnaphthalene	91-57-6	Naphthalene, 2-methyl-	8270	
Methyl parathion; Parathion methyl	298-00-0	Phosphorothioic acid, O,O-dimethyl O-(4-nitrophenyl) ester	8140	
			8270	
4-Methyl-2-pentanone; Methyl isobutyl ketone	108-10-1	2-Pentanone, 4-methyl-	8015	
			8240	
Naphthalene	91-20-3	Naphthalene	8100	
			8270	
1,4-Naphthoquinone	130-15-4	1,4-Naphthalenedione	8270	
1-Naphthylamine	134-32-7	1-Naphthalenamine	8270	
2-Naphthylamine	91-59-8	2-Naphthalenamine	8270	
Nickel	(Total)	Nickel	6010	
			7520	
o-Nitroaniline	88-74-4	Benzenamine, 2-nitro-	8270	
m-Nitroaniline	99-09-2	Benzenamine, 3-nitro-	8270	
p-Nitroaniline	100-01-6	Benzenamine, 4-nitro-	8270	
Nitrobenzene	98-95-3	Benzene, nitro-	8090	
			8270	
o-Nitrophenol	88-75-5	Phenol, 2-nitro-	8040	
			8270	
p-Nitrophenol	100-02-7	Phenol, 4-nitro-	8040	
			8270	
4-Nitroquinoline 1-oxide	56-57-5	Quinoline, 4-nitro-, 1-oxide	8270	
N-Nitroso-n-butylamine	924-16-3	1-Butanamine, N-butyl-N-nitroso-	8270	
N-Nitrosodiethylamine	55-18-5	Ethanamine, N-ethyl-N-nitroso-	8270	
N-Nitrosodimethylamine	62-75-9	Methanamine, N-methyl-N-nitroso-	8270	
N-Nitrosodiphenylamine	86-30-6	Benzenamine, N-nitroso-N-phenyl-	8270	
N-Nitrosodipropylamine; Di-n-propylnitrosamine	621-64-7	1-Propanamine, N-nitroso-N-propyl-	8270	
N-Nitrosomethylethylamine	10595-95-6	Ethanamine, N-methyl-N-nitroso-	8270	
N-Nitrosomorpholine	59-89-2	Morpholine, 4-nitroso-	8270	
N-Nitrosopiperidine	100-75-4	Piperidine, 1-nitroso-	8270	
N-Nitrosopyrrolidine	930-55-2	Pyrrolidine, 1-nitroso-	8270	
5-Nitro-o-toluidine	99-55-8	Benzenamine, 2-methyl-5-nitro-	8270	
Parathion	56-38-2	Phosphorothioic acid, O,O-diethyl-O-(4-nitrophenyl) ester	8270	
Polychlorinated biphenyls; PCBs	See Note 7	1,1'-Biphenyl, chloro derivatives	8080	
			8250	
Polychlorinated dibenzo-p-dioxins; PCDDs	See Note 8	Dibenzo[b,e][1,4]dioxin, chloro derivatives	8280	
Polychlorinated dibenzofurans; PCDFs	See Note 9	Dibenzofuran, chloro derivatives	8280	
Pentachlorobenzene	608-93-5	Benzene, pentachloro-	8270	
Pentachloroethane	76-01-7	Ethane, pentachloro-	8240	
			8270	
Pentachloronitrobenzene	82-68-8	Benzene, pentachloronitro-	8270	
Pentachlorophenol	87-86-5	Phenol, pentachloro-	8040	
			8270	
Phenacetin	62-44-2	Acetamide, N-(4-ethoxyphenyl)	8270	
Phenanthrene	85-01-8	Phenanthrene	8100	
			8270	
Phenol	108-95-2	Phenol	8040	
			8270	
p-Phenylenediamine	106-50-3	1,4-Benzenediamine	8270	
Phorate	298-02-2	Phosphorodithioic acid, O,O-diethyl S-[(ethylthio)methyl] ester	8140	
			8270	
2-Picoline	109-06-8	Pyridine, 2-methyl-	8240	
			8270	
Pronamide	23950-58-5	Benzamide, 3,5-dichloro-N-(1,1-dimethyl-2-propynyl)-	8270	
Propionitrile; Ethyl cyanide	107-12-0	Propanenitrile	8015	
			8240	
Pyrene	129-00-0	Pyrene	8100	
			8270	
Pyridine	110-86-1	Pyridine	8240	
			8270	

APPENDIX IX—GROUND-WATER MONITORING LIST [1]—Continued

Common name [2]	CAS RN [3]	Chemical abstracts service index name [4]	Suggested methods [5]
Safrole	94-59-7	1,3-Benzodioxole, 5-(2-propenyl)-	8270
Selenium	(Total)	Selenium	6010
			7740
			7741
Silver	(Total)	Silver	6010
			7760
Silvex; 2,4,5-TP	93-72-1	Propanoic acid, 2-(2,4,5-trichlorophenoxy)-	8150
Styrene	100-42-5	Benzene, ethenyl-	8020
			8240
Sulfide	18496-25-8	Sulfide	9030
2,4,5-T; 2,4,5-Trichlorophenoxyacetic acid	93-76-5	Acetic acid, (2,4,5-trichlorophenoxy)-	8150
2,3,7,8-TCDD; 2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746-01-6	Dibenzo[b,e][1,4]dioxin, 2,3,7,8-tetrachloro-	8280
1,2,4,5-Tetrachlorobenzene	95-94-3	Benzene, 1,2,4,5-tetrachloro-	8270
1,1,1,2-Tetrachloroethane	630-20-6	Ethane, 1,1,1,2-tetrachloro-	8010
			8240
1,1,2,2-Tetrachloroethane	79-34-5	Ethane, 1,1,2,2-tetrachloro-	8010
			8240
Tetrachloroethylene; Perchloroethylene; Tetrachloroethene	127-18-4	Ethene, tetrachloro-	8010
			8240
2,3,4,6-Tetrachlorophenol	58-90-2	Phenol, 2,3,4,6-tetrachloro-	8270
Tetraethyl dithiopyrophosphonate; Sulfotepp	3689-24-5	Thiodiphosphonic acid ([(HO)$_2$P(S)]$_2$O), tetraethyl ester	8270
Thallium	(Total)	Thallium	6010
			7840
			7841
Tin	(Total)	Tin	7870
• Toluene	108-88-3	Benzene, methyl-	8020
			8240
o-Toluidine	95-53-4	Benzenamine, 2-methyl-	8270
Toxaphene	8001-35-2	Toxaphene	8080
			8250
1,2,4-Trichlorobenzene	120-82-1	Benzene, 1,2,4-trichloro-	8270
1,1,1-Trichloroethane; Methylchloroform	71-55-6	Ethane, 1,1,1-trichloro-	8240
1,1,2-Trichloroethane	79-00-5	Ethane, 1,1,2-trichloro-	8010
			8240
Trichloroethylene; Trichloroethene	79-01-6	Ethene, trichloro-	8010
			8240
Trichlorofluoromethane	75-69-4	Methane, trichlorofluoro-	8010
			8240
2,4,5-Trichlorophenol	95-95-4	Phenol, 2,4,5-trichloro-	8270
2,4,6-Trichlorophenol	88-06-2	Phenol, 2,4,6-trichloro-	8040
			8270
1,2,3-Trichloropropane	96-18-4	Propane, 1,2,3-trichloro-	8010
			8240
O,O,O-Triethyl phosphorothioate	126-68-1	Phosphorothioic acid, O,O,O-triethyl ester	8270
sym-Trinitrobenzene	99-35-4	Benzene, 1,3,5-trinitro-	8270
Vanadium	(Total)	Vanadium	6010
			7910
			7911
Vinyl acetate	108-05-4	Acetic acid, ethenyl ester	8240
Vinyl chloride	75-01-4	Ethene, chloro-	8010
			8240
• Xylene (total)	1330-20-7	Benzene, dimethyl-	8020
			8240
Zinc	(Total)	Zinc	6010
			7950

[1] The regulatory requirements pertain only to the list of substances; the right hand columns (Methods and PQL) are given for purposes only. See also footnotes 5 and 6.

[2] Common names are those widely used in government regulations, scientific publications, and commerce; synonyms exist for m chemicals.

[3] Chemical Abstracts Service registry number. Where "Total" is entered, all species in the ground water that contain this element included.

[4] CAS index names are those used in the 9th Cumulative Index.

[5] Suggested Methods refer to analytical procedure numbers used in EPA Report SW-846 "Test Methods for Evaluating Solid Waste", edition November 1986. Analytical details can be found in SW-846 and in documentation on file at the agency. CAUTION: The methods listed representative SW-846 procedures and may not always be the most suitable method(s) for monitoring an analyte under the regulato

[6] Practical Quantitation Limits (PQLs) are the lowest concentrations of analytes in ground waters that can be reliably determined w specified limits of precision and accuracy by the indicated methods under routine laboratory operating conditions. The PQLs listed are gene

s[illegible] to one significant figure. CAUTION: The PQL values in many cases are based only on a general estimate for the method and not on a c[illegible]ination for individual compounds: PQLs are not a part of the regulation.

Polychlorinated biphenyls (CAS RN 1336-36-3); this category contains congener chemicals, including constituents of Aroclor-1016 (CAS RN [illegible]4-11-2), Aroclor-1221 (CAS RN 11104-28-2), Aroclor-1232 (CAS RN 11141-16-5), Aroclor-1242 (CAS RN 53469-21-9), Aroclor-1248 (CAS [illegible].2672-29-6), Aroclor-1254 (CAS RN 11097-69-1), and Aroclor-1260 (CAS RN 11096-82-5). The PQL shown is an average value for PCB congeners.

* This category contains congener chemicals, including tetrachlorodibenzo-p-dioxins (see also 2,3,7,8-TCDD), pentachlorodibenzo-p-dioxins, and hexachlorodibenzo-p-dioxins. The PQL shown is an average value for PCDD congeners.

* This category contains congener chemicals, including tetrachlorodibenzofurans, pentachlorodibenzofurans, and hexachlorodibenzofurans. The PQL shown is an average value for PCDF congeners.

PART 270—AMENDED

1. The authority citation for Part 270 is revised to read as follows:

Authority: Secs. 1006, 2002(a), 3001, 3004, and 3005 of the Solid Waste Disposal Act, as amended, 42 U.S.C. 6905, 6912(a), 6924 and 6925.

2. Section 270.14 is amended by revising paragraph (c)(4)(ii) to read as follows:

§ 270.14 Contents of Part B: general requirements.

* * * * * * *

(c) * * *

(4) * * *

(ii) Identifies the concentration of each Appendix IX. of Part 264 of this chapter, constituent throughout the plume or identifies the maximum concentrations of each Appendix IX constituent in the plume.

[FR Doc. 87-14658 Filed 7-8-87; 8:45 am]

BILLING CODE 6560-50-M

IV.LT.5. Sample Collection Protocol and Static Water Level Measurement Protocol

This Attachment is an excerpt from the BN Paradise Land Treatment Permit Application

APPENDIX O

STANDARD OPERATING PROCEDURES

SOP 110: Packaging and Shipment of Samples

1.0 Purpose and Applicability

This SOP is concerned with the proper packaging and shipment of samples to minimize the potential for sample breakage, leakage or cross contamination and to provide a clear record of sample custody from collection to analysis.

The EPA RCRA regulations (40 CFR Section 261.4 (d)) specify that samples of solid waste, water, soil, or air, collected for the purpose of testing are exempt from regulation when the following conditions apply:

- Samples are being transported to a laboratory for analysis;
- Samples are being transported to the collector from the laboratory after analysis;
- Samples are being stored (1) by the collector prior to shipment for analyses, (2) by the analytical laboratory prior to analyses, (3) by the analytical laboratory after testing but prior to return of sample to the collector or pending the conclusion of a court case.

Samples collected by ReTec are generally qualified for these exemptions. This SOP deals only with these sample types.

2.0 Responsibilities

The field sampling coordinator shall be responsible for the enactment and completion of the chain of custody and the packaging and shipping requirements outlined here and in project specific sampling plans.

3.0 Supporting Materials

- Chain of Custody Forms and Tape
- Coolers or similar shipping containers
- Transparent packaging tape
- Zip-lock type bags
- Protective wrapping and packaging materials

4.0 Methods

All samples must be packaged so that they do not leak, break or vaporize. Waste samples should not be containerized with environmental samples to minimize chances of cross contamination. All samples must be properly identified and each shipment or transfer must be accompanied by a chain of custody record.

All samples are to be clearly identified immediately upon collection. Each sample bottle should include the following information:

- Client or project name
- A unique sample description
- Sample collection date and time
- Sampler's name or initials

After samples are collected, identified and preserved in the field, they are maintained under chain of custody procedures as described below.

4.1 Chain of Custody

A sample is in your custody if it is in your possession, in your view or in a designated secure area. Sample custody transfers must be documented by chain of custody forms.

Chain of custody forms are generally provided by the analytical laboratory. The following information must be included on chain of custody records:

- Sample collector's name, mailing address and telephone number
- Analytical laboratory's name, mailing address and telephone number
- Description of each sample

- Quantity of each sample and type of analysis required
- Date of collection and of shipment

When transferring the custody of samples, the individuals relinquishing and receiving will sign, date and note the time on the form. If samples are to leave your possession for shipment to the laboratory, the following packaging procedures should be followed.

4.2 Packaging for Shipment

When preparing a cooler for shipment, all contents are to be removed and the samples inventoried and logged on the chain of custody form. As each sample bottle is logged on the chain of custody form, it should be wrapped with protective material (e.g. bubble wrap matting or plastic gridding) to prevent against breakage. Each sample bottle should be packaged in an upright condition. All sample bottle caps should be checked during this time and tightened if needed. Additional packaging material such as bubble wrap or styrofoam pellets should be spread throughout the voids between the sample bottles.

Most samples require refrigeration as a minimum preservative. Cold packs or ice placed in heavy duty zip-lock type bags should be distributed over the top of the samples.

Additional packing material should then be placed to fill the balance of the cooler or container.

Place the completed chain of custody records in a zip-lock type plastic bag and place the bag on the top of the contents within the cooler or shipping container. Retain a copy of the chain of custody record with the field records.

Close the top or lid of the cooler or shipping container and with another person rotate/shake the container to verify that the contents are packed so that they do not move. Add additional packaging if needed and reclose.

Place chain of custody tape (signed and dated) at two different locations (front and back) on the cooler or container lid and overlap with transparent packaging tape. Packaging tape should encircle each end of the cooler at the hinges.

Sample shipment should occur via an overnight express service that can guarantee 24 hour delivery. Retain copies of all shipment records as provided by the shipper.

5.0 Documentation

The documentation for support of proper packaging and shipment will include chain of custody records and shippers records. All documentation will be retained in the project files.

SOP 120: Decontamination

1.0 Purpose and Applicability

This SOP describes the methods to be used for the decontamination of all field equipment which becomes potentially contaminated during a sample collection task. The equipment may include split spoons, bailers, trowels, shovels, hand augers, or any other type of equipment used during field activities.

Decontamination is performed as a quality assurance measure and a safety precaution. It prevents cross contamination between samples and also helps to maintain a clean working environment.

Decontamination is achieved mainly by rinsing with liquids which include: soap and or detergent solutions, tap water, distilled water, and methanol. Equipment may be allowed to air dry after being cleaned or may be wiped dry with chemical free cloths or paper towels if immediate re-use is needed.

At most project sites, decontamination will be accomplished between each sample collection point. Waste products produced by the decontamination procedures such as waste liquids, solids, rags, gloves, etc. will be collected and disposed of properly based on the nature of contamination. Specific details for the handling of the decontamination wastes will be addressed in the

project plans.

2.0 Responsibilities

It is the responsibility of the field sampling coordinator to assure that the proper decontamination procedures are followed and that all waste materials produced by decontamination are properly managed. It is the responsibility of the project safety officer to draft and enforce safety measures which provide the best protection for all persons involved directly with sampling and or decontamination.

It is the responsibility of any subcontractors (i.e., drilling contractors) to follow the proper, designated decontamination procedures that are stated in their contracts and outlined in the Project Health and Safety Plan. It is the responsibility of all personnel involved with sample collection or decontamination to maintain a clean working environment and to ensure that any contaminants are not negligently introduced to the environment.

3.0 Supporting Materials

- Cleaning liquids and dispensers: soap and or detergent solutions, tap water, distilled water, methanol

- Personal safety gear as defined in the Project Health and Safety Plan
- Chemical free paper towels
- Disposable gloves
- Waste storage containers: drums, boxes, plastic bags
- Cleaning containers: plastic and/or galvanized steel pans and buckets
- Cleaning brushes
- Aluminum foil

4.0 Methods

The extent of known contamination will determine the degree of decontamination required. If the extent of contamination cannot be readily determined, cleaning should be done according to the assumption that the equipment is highly contaminated.

The standard procedures listed below can be considered the procedure for full field decontamination. If different or more elaborate procedures are required for a specific project, they will be spelled out in the project plans. Such variations in decontamination may include following all, just part, or an expanded scope of the decontamination procedure stated herein.

- Remove gross contamination from the equipment by brushing and then rinsing with tap water.
- Wash with soap or detergent solution.
- Rinse with tap water.

- Rinse with methanol.
- Rinse with distilled water.
- Repeat entire procedure or any parts of the procedure as necessary.

5.0 Quality Control

To assess the adequacy of decontamination procedures, field blanks are collected for aqueous samples and replicates are collected for soil samples. The specific number of blanks and replicates will be defined in the project sampling plan. In general, for water samples, one field blank will be collected per sampling event and per sampling equipment.

SOP 230: Groundwater Sampling

1.0 Purpose and Applicability

This SOP is concerned with the collection of valid and representative samples from groundwater monitoring wells.

2.0 Responsibilities

The field sampling coordinator will have the responsibility to oversee and ensure that all groundwater sampling is performed in accordance with the project specific sampling program and this SOP. In addition, the field sampling coordinator must ensure that all field workers are fully apprised of this SOP.

3.0 Supporting Materials

The list below identifies the types of equipment which may be used for a range of groundwater sampling applications. From this list, a project specific equipment list will be selected based upon project objectives, the depth to ground water, purge volumes, analytical parameters and well construction. The types of sampling equipment are as follows:

3.1 Purging/Sample Collection

- o Bailers and bailer cord
- o Centrifugal pump
- o Bladder pump
- o Peristaltic pump

3.2 Sample Preparation/Field Measurement

- o pH meter
- o Specific conductance meter
- o Filtration apparatus
- o Water level measurement equipment

3.3 General

- o Project specific sampling program
- o Distilled water dispenser bottle
- o Methanol dispenser bottle
- o Personal protection equipment as specified in the Project Health and Safety Plan
- o Field data sheets and log book
- o Preservation solutions
- o Sample containers

Project-specific sampling procedures and equipment are outlined on the next page.

45.2 Description of Sampling and Analysis Procedures (40 CFR 264.97(d))

45.2.1 Sample Collection Methods

Standard Operating Procedure (SOP) 230 describes groundwater sampling methods which will be used in groundwater monitoring activities. Depending on the stability of pH and conductivity readings, three or more well volumes will be withdrawn prior to sample collection.

Rapid and contaminant free sampling will be ensured using Well Wizard™ monitoring systems, as previously installed on some of the existing wells within the Paradise tie treating site. The Well Wizard™ system consists of dedicated submersible bladder pumps constructed of teflon and stainless steel which will be installed in each monitoring well.

45.2.2 Sample Preservation and Shipment

Prior to transport or shipment, groundwater samples may require preparation or preservation. Specific sample preservation techniques which will be used are described in the EPA document, Handbook for Sampling and Sample Preservation of Water and Wastewater (EPA-600/4-82-029) for the designated laboratory analyses.

SOP 110 (Appendix O) describes the procedures which will be used for packaging and shipment of samples. The objective of proper packaging and shipment is to minimize the potential for sample breakage, leakage or cross contamination and to provide a clear record of sample custody from collection to analysis. Samples must be properly marked in waterproof ink.

- Buckets and intermediate containers
- Coolers
- Water filters
- Chemical free paper towels

4.0 Water Level Measurement

After unlocking and/or opening a monitoring well, the first task will be to obtain a water level measurement. Water level measurements will be made using an electronic or mechanical device.

The measuring point location for the well should be clearly marked on the outermost casing or identified in previous sample collection records. If no measuring point can be determined, a measuring point should be established. Typically the top of the protective or outermost well casing will be used as the measuring point. The measuring point location should be described on the Groundwater Sample Collection Record (see Figure 1).

To obtain a water level measurement lower a decontaminated mechanical or an electronic sounding unit into the monitoring well until the audible sound of the unit is detected or indicates water contact. At this time the precise measurement should be determined by repeatedly raising and lowering the tape or cable

FIGURE 1

GROUND-WATER SAMPLE COLLECTION RECORD

TIME

WELL NO. _____ START: _____

FINISH: _____

SAMPLED BY: _____ DATE: _____

WEATHER CONDITIONS: _____

WELL SECURTIY/CONDITION _____

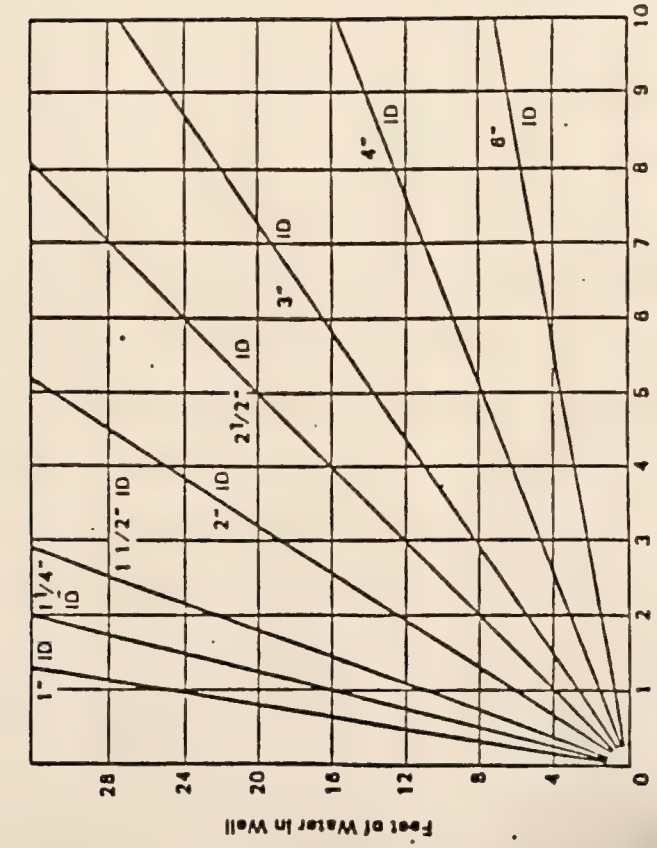
1. WATER LEVEL MEASUREMENT
   a. DEPTH TO WATER TABLE FROM MEASURING POINT _____FT
   b. LOCATION OF MEASURING POINT _____
   c. HEIGHT OF MEASURING POINT ABOVE GROUND SURFACE _____FT
2. WELL PURGING
   a. TOTAL DEPTH OF WELL BELOW MEASURING PT. _____FT
   b. LENGTH OF WATER COLUMN (LINE 2a - LINE 1a)
   _____FT
   c. PURGE METHOD _____
   d. REQUIRED PURGE VOLUME @ 4 WELL VOLUMES (SEE FIGURE 1) _____

DURATION OF PUMPING	VOLUME REMOVED	pH	SPECIFIC COND.	COLOR	T(°C)

3. SAMPLE COLLECTION
   a. COLLECTION METHOD _____
   b. SAMPLE COLLECTION TIME _____
   c. SAMPLE INFORMATION pH_____Specific Cond._____T(°C)_____

ANALYSIS	CONTAINER TYPE	SAMPLE PREPARATION/PRESERVATION

4. COMMENTS _____
   _____
   _____



(a) Graphical Explanation

Volume/Linear Ft. of Pipe		
ID(in)	Gal	Liter
1/4	0.003	0.010
3/8	0.006	0.022
1/2	0.010	0.039
3/4	0.023	0.087
1	0.041	0.164
2	0.163	0.618
3	0.367	1.39
4	0.653	2.47
6	1.47	5.56

(b) Volume Factors

FIGURE 2

to converge on the exact measurement. The water level measurement should be entered on the Groundwater Sample Collection Record. The water level measurement device shall be decontaminated immediately after use.

5.0 Purging and Sample Collection Procedures

5.1 Introduction

Purging must be performed for all groundwater monitoring wells prior to sample collection. Depending on the stability of pH and conductivity readings, 3 or more volumes of groundwater present in a well shall be withdrawn prior to sample collection. The volume of water present in each well shall be computed using the two measurable values, length of water column and monitoring well inside diameter. Figures 2(a) and 2(b) will be used to compute the well volume and required purge volume.

Three general methods are used for well purging. Well purging may be achieved using bailers, surface pumps, or down well submersible pumps. In all cases pH and or specific conductance will be monitored during purging. Field parameter values will be entered on the Groundwater Sample Collection Record along with the corresponding purge volume. The following sections explain the procedures to be used to purge and collect samples from monitoring wells.

5.2 Bailing

Obtain a clean decontaminated bailer and a spool of polypropylene rope or equivalent bailer cord. Using the rope at the end of the spool tie a bowline knot or equivalent through the bailer loop. Test the knot for adequacy by creating tension between the line and the bailer. Tie again if needed.

Lower the bailer to the bottom of the monitoring well and remove an additional five feet of cord from the spool. Cut the cord at the spool and secure the rope to the well head or the wrist of the person who shall perform the bailing.

Raise the bailer by grasping a section of cord using each hand alternately. This bailer lift method is used so that the bailer cord will not come into contact with the ground or other potentially contaminated surfaces.

Samples collected by bailing will be poured directly into sample containers from bailers which are full of fresh groundwater. Fill VOA vial first. During sample collection, bailers will not be allowed to contact the sample containers.

5.3 Pumping (see project-specific procedures after page 2)

Groundwater withdrawal using pumps is commonly performed with centrifugal, peristaltic, submersible or bladder pumps. Peristaltic and centrifugal pumps are limited to conditions where groundwater need only be raised through approximately 20 to 25

feet of vertical distance. Submersible or bladder pumps can be used when groundwater is greater than 25 feet below grade. Specific methods for pumps will be discussed in the project specific sampling plan. Pumping for collection of samples to be analyzed for volatile organics will only be with bladder pumps.

6.0 Sample Preparation and Filtration

Prior to transport or shipment, groundwater samples may require preparation and or preservation. Field preparation may entail filtration, or preservation in the form of chemical additives or temperature control.

Specific preservation techniques are described in the EPA document, Handbook for Sampling and Sample Preservation of Water and Wastewater (EPA - 600/4-82-029). The EPA manual will be consulted during the planning stage of the project. Project specific sampling plans shall be assembled using the approved procedures obtained from the EPA manual.

Groundwater samples collected for dissolved metals analyses will be filtered prior to being placed in sample containers. Groundwater filtration will be performed using a peristaltic pump and a 0.45 micron water filter. For most dissolved metal analyses, pH adjustment of the sample is also required and shall be performed after filtration.

IV.LT.6. Critical levels for Appendix IX Metals

ATTACHMENT IV.LT.6.

CRITICAL LEVELS FOR APPENDIX IX METALS

Compound	Critical Level (ug/l)
arsenic	50
barium	100
cadmium	10
chromium	50
copper	60
lead	50
mercury	2
nickel	50
selenium	10
silver	50
zinc	5000

IV.LT.7. Detection Monitoring Protocol

ATTACHMENT IV.LT.7

GROUNDWATER DETECTION MONITORING SCHEDULE

Schedule	Step	Activity
Semi-annually	1	Routine PHC sampling and analysis under Permit Condition IV.LT.E.4.a.
	2	Permittee receives analytical report for routine semi-annual sampling. If no PHC is detected in any monitoring well,the Permittee may return to Step 1
Within 30 days of Step 2	3	If any PHC(s) is detected in any monitoring well above critical levels, the Permittee shall resample only for those constituents and in those wells where the PHC(s) were detected above critical levels. (See Permit Condition IV.LT.E.4.b.)
	4	The Permittee shall report analytical results from Step 2 to the Department in writing.
	5	Permittee receives analytical report for repeat PHC sampling (Step 3) a. If analytical results show no PHC detected in the sampled well(s), the Permittee may return to Step 1. b. If analytical results from Step 3 analysis show PHC(s) above the critical level(s) in a compliance point well, this signifies the beginning of compliance monitoring under Condition IV.LT.E.4.f. c. If analytical results indicate any of the conditions under IV.LT.E.4.d.i and ii or iii, iv, or v apply, the Permittee may submit an assessment report in accordance with IV.LT.E.5. in lieu of entering a Compliance Monitoring program and return to Step 1.
Within 7 days of Step 5b	*6	Submit notice of intent pursuant to Condition IV.LT.E.7.a.
Within 30 days of Step 5	7	Analytical results from Step 5 must be reported to the Department in writing.
Within 90 days of Step 5b	8	The Permittee shall submit to the Department: *o A demonstration that the regulated unit is not the cause of any occurrence of Appendix IX or PHC compound detected above critical levels. o Results from Appendix IX sampling and analysis. o A permit modification application o A compliance monitoring program. o An engineering feasibility plan for corrective action
Within 90 days of Step 5c	9	The Permittee shall submit to the Department an assessment report in accordance Conditions IV.LT.E.4.d. and IV.LT.E.5.
Within 180 days of Step 5	10	The Permittee shall submit to the Department: o A corrective action plan.

*Optional

IV.LT.8. High Performance Liquid Chromatography
QA/QC data requirements

QUALITY CONTROL/QUALITY ASSURANCE REQUIREMENTS
for HPLC Analysis of Principal Hazardous Constituents

The following describes minimum QA/QC analysis which must be performed and reported by the laboratory as described in SW846. Attached are Forms 1-7 which when completed comprise a complete analytical report, including sample results (Form 1).

I. Initial Demonstration of precision and accuracy and calculation of Method Detection Limits (MDL's)

On an initial basis, the analyst must establish the ability to generate acceptable accuracy, precision, and method detection limits by performing the following operations:

A. A quality control (QC) check sample concentrate is required containing each regulated analyte. The QC check sample is spiked into reagent water at a concentration between one and five times the estimated MDL. The QC check sample must be prepared by the laboratory using stock standards prepared independently form those used for calibration. A minimum of seven aliquots of the spiked samples are processed through the entire analytical method.

B. Calculate the average recovery ($\overline{x}$) in µg/L for each analyte using the seven results. Calculate the MDL according to Glaser et al. (Env. Sci. Tech., Vol. 15(12), 1981, pp. 1426-1435.).

C. For each parameter, compare the average recovery ($\overline{x}$) in µg/L with the corresponding acceptance criteria for accuracy and precision found in Table 4 of 8310. If s and $\overline{x}$ for all parameters of interest meet the acceptance criteria, the system performance is acceptable and analysis of actual samples can begin. If any individual $\overline{x}$ falls outside the range for accuracy, or if any individual s exceeds the precision limit, the system performance is unacceptable for that parameter.

D. Refer to the upper and lower control limits for MDL's as cited in Glaser et al. If the calculated MDL's for each parameter are within these limits, then the system performance is acceptable.

E. Reporting Requirements

Refer to Form 2 to report the above information.

-After the analysis of five spiked samples of the same matrix, calculate the average percent recovery ($\bar{p}$) and the standard deviation of the percent recovery (s_p). Express the accuracy assessment as a percent recovery interval from $\bar{p}-2s_p$ to $\bar{p}+2s_p$. Update the accuracy for each analyte on a regular basis (e.g. after each 5 to 10 new accuracy measurements). The laboratory may use the updated accuracy assessment in lieu of those calculated from Table 4 (8310-12).

c. If an individual p falls outside of the designated range for recovery, that analyte has failed acceptance criteria. A check standard containing each analyte that failed the acceptance criteria must be analyzed. As an alternative, the laboratory may routinely analyze a QC check sample with each analytical batch.

Prepare the QC check standard as described in 8410 (8.2.1). Add 1.0 ml of the to 1000 ml of reagent water, extract and analyze according to the method. Compare percent recovery for each analyte with the corresponding QC acceptance criteria found in Table 3 of Method 8310 (p.11). If the accuracy of any of the analytes still falls outside the designated range established in Table 3 or by the laboratory, the laboratory performance for the analyte is judged to be out of control, and the problem must be identified and corrected. The results for that analyte in the unspiked samples are suspect and may not be reported for regulatory compliance purposes.

3. Calculate and evaluate precision.

a. Calculate precision as the relative percent difference (RPD) between the spike recoveries for each analyte of the matrix spike and the matrix spike duplicate: $RPD=(|MS_a-MSD_a|/\bar{x})x100$
where MS_a=Concentration of analyte a in the matrix spike, MSD_a=concentration of analyte a in the matrix spike duplicate and $\bar{x}$ is the average of the concentrations of analyte a in the matrix spike and matrix spike duplicate.

b. Referring to Table 4 (8310-12), calculate s_r' and the limit for the RPD for an individual analyte as $(s_r')/Tx100$.

After the analysis of five matrix spikes and five matrix spike duplicates, calculate the average RPD for each analyte. Update the precision assessment for each analyte on a regular basis (every 5-10 samples). The laboratory may use the average RPD as a precision assessment criteria in lieu of those calculated from Table 4(8310-12).

4. Reporting

When reporting analytical results, use Form 4, titled "Water Matrix Spike/Matrix Spike Duplicate Recovery" to report the quality control data described above.

C. Surrogate Spikes

Surrogates are organic compounds which are similar to analytes of interest in chemical composition, extraction, and chromatography, but which are not normally found in environmental samples. Their use allows the data quality of an individual sample to be evaluated.

For Method 8310, decafluorobiphenzl or other PAH's not expected to be in the sample may be used. These compounds are spiked into all blanks, standards, samples, and spiked samples prior to analysis. The laboratory may choose an appropriate level for surrogate spiking.

1. For each sample analyzed, calculate the percent recovery of each surrogate in the sample.

2. Once a minimum of thirty samples of the same matrix have been analyzed, calculate the average percent recovery ($\overline{p}$) and standard deviation of the percent recovery (s) for each of the surrogates.

3. For a given matrix, calculate the upper and lower control limits for method performance for each surrogate standard.

   Upper Control Limit (UCL) = $\overline{p}+3S$
   Lower Control Limit (LCL) = $\overline{p}-3S$

4. If the recovery is not within limits, the following is required:

   -Check to be sure that there are no errors in calculations, surrogate solutions, and standards. Also check instrument performance.

   -Recalculate the data and/or reanalyze the extract if any of the above checks reveal a problem.

   -Re-extract and reanalyze the sample if none of the above are a problem or flag the data as "estimated concentration."

5. As a minimum, the laboratory should update surrogate recovery limits annually.

6. Form 5, Water Surrogate Percent Recovery Summary, should be used to report results of this section.

III. CALIBRATION AND DAILY CALIBRATION CHECK

The laboratory may perform either an external standard calibration procedure (8000-2, 8310-3) or an internal standard calibration procedure (8000-3, 8310-4).

A. For the external standard procedure, if the percent relative standard deviation (%RSD) of the calibration factor (see equation below) is less

than 20% over the working range, then linearity through the origin can be assumed and the average calibration factor can be used in place of a calibration curve.

%RSD=$(R_1-R_2)/R_1$X100 where R_1 = Calibration Factor from the first analysis R_2 = Calibration Factor from succeeding analysis.

B. For internal standards procedure, if the response factor (RF) over the working range is constant (< 20% RSD), the RF can assumed to be invariant and the average RF can be used.

RF=$(A_s C_{is})/(A_{is} C_s)$ where: A_s=Response for the analyte to be measured
A_{is}=Response for the internal standard
C_{is}=Concentration of the internal standards, µg/L
C_s=Concentration of the analyte to be measured, µg/L

C. Whether the external or internal standard procedure is used, the working calibration curve or calibration factor must be verified on each working day by the injection of one or more calibration standards. If the response for any analyte varies from the predicted response by more than ±15%, a new calibration curve must be prepared for that compound.

D. Form 6, Initial Data Calibration, is used to report the results of the initial calibration.

E. Form 7, Retention Time Windows and Calibration Verification, is used to report the information acquired in C and in IV below.

IV. RETENTION TIME WINDOWS

Retention time windows are necessary to properly identify compounds. The laboratory may use the guidance of SW846, 8000-4,5 and the experience of their analysts to set retention time windows. Form 6 is used to report these windows.

Form 1. ORGANIC ANALYSIS DATA SHEET

Sample No.
_____

Laboratory Name: _____
Lab Sample ID No: _____
Sample Matrix: _____
Date Extracted: _____
Date Analyzed: _____
Conc/Dilution Factor: _____

Date Sample Collected: _____
Date Sample Received: _____
Date Reported From Lab: _____
Extraction Method: _____
Analytical Method: _____

Compound	Retention Time	Concentration	Units
Naphthalene			
Acenaphthylene			
Acenaphthene			
Fluorene			
Phenanthrene			
Anthracene			
Fluoranthene			
Pyrene			
Benzo(a)anthracene			
Chrysene			
Benzo(b)fluoranthene			
Benzo(k)fluoranthene			
Benzo(a)pyrene			
Benzo(ghi)perylene			
Dibenzo(ah)anthracene			
Indeno(123-cd)pyrene			

Form 2. INITIAL DEMONSTRATION OF ACCURACY, PRECISION, AND METHOD DETECTION LIMITS (MDL)

Date Initial Demonstration Performed: _____

Laboratory: _____ Method: _____

Compound	x	QC Limits	s	QC Limits	MDL	QC Limits
Naphthalene						
Acenaphthylene						
Acenaphthene						
Fluorene						
Phenanthrene						
Anthracene						
Fluoranthene						
Pyrene						
Benzo(a)anthracene						
Chrysene						
Benzo(b)fluoranthene						
Benzo(k)fluoranthene						
Bezo(a)pyrene						
Benzo(ghi)Perylene						
Dibenzo(ah)anthracene						
Ideno(123-cd)pyrene						

Form 3. METHOD BLANK SUMMARY

Laboratory: _____ Date: _____

Method: _____

Compounds	Concentration (µg/L)
Naphthalene	
Acenaphthylene	
Acenaphthene	
Fluorene	
Phenanthrene	
Anthracene	
Fluoranthene	
Pyrene	
Benzo(a)anthracene	
Chrysene	
Benzo(b)fluoranthene	
Benzo(k)fluoranthene	
Benzo(a)pyrene	
Benzo(ghi)Perylene	
Dibenzo(ah)anthracene	
Ideno(123-cd)pyrene	

Form 4. WATER MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Sample # _____ Laboratory Name: _____ Method: _____

Date: _____

Compound	Conc. Spike Added(ug/L)	Sample Result(ug/L)	Concentration Matrix Spike	% Recovery	Concentration Matrix Spike Duplicate	% Recovery	RPD	QC Limits RPD	QC Limits % Recovery
Naphthalene									
Acenaphthylene									
Acenaphthene									
Fluorene									
Phenanthrene									
Anthracene									
Fluoranthene									
Pyrene									
Benzo(a)anthracene									
Chrysene									
Benzo(b)fluoranthene									
Benzo(k)fluoranthene									
Benzo(a)pyrene									
Benzo(ghi)Perylene									
Dibenzo(ah)anthracene									
Ideno(123-cd)pyrene									

Form 5. WATER SURROGATE PERCENT RECOVERY SUMMARY

Laboratory Name: _____ Method: _____

Date: _____

Sample #/I.D.	Surrogate 1 % Recovery	QC Limits LCL-UCL	Surrogate 2 % Recovery	QC Limits LCL-Ucl

Form 6. Initial Calibration Data

Laboratory: _____ Method: _____

Date: _____

Internal or External Standards Calibration Procedure: _____

Nanograms:	RF	RF	RF	RF	RF	RF	%RSD
Compound							
Naphthalene							
Acenaphthylene							
Acenaphthene							
Fluorene							
Phenanthrene							
Anthracene							
Fluoranthene							
Pyrene							
Benzo(a)anthracene							
Chrysene							
Benzo(b)fluoranthene							
Benzo(k)fluoranthene							
Benzo(a)pyrene							
Benzo(ghi)Perylene							
Dibenzo(ah)anthracene							
Ideno(123-cd)pyrene							

Form 7. RETENTION TIME WINDOWS AND CALIBRATION VERIFICATION

Laboratory: _____ Method: _____

	Initial Calibration Data Date of Analysis_____ Internal/External Procedure_____		Daily Calibration Verification Date_____		
Compound	Retention Time Window	Average Calibration Factor	Retention Time	Calibration Factor	Percent Difference
Naphthalene					
Acenaphthylene					
Fluorene					
Phenanthrene					
Anthracene					
Fluoranthene					
Pyrene					
Benzo(a)anthracene					
Chrysene					
Benzo(b)fluoranthene					
Benzo(k)fluoranthene					
Benzo(a)pyrene					
Benzo(ghi)perylene					
Dibenzo(ah)anthracene					
Indo(123-cd)pyrene					

IV.LT.9. Gas Chromatography/Photoionization Detector (GC/PID) QA/QC data requirements

QUALITY CONTROL/QUALITY ASSURANCE REQUIREMENTS FOR ANALYSIS OF VOLATILE AROMATICS USING SW-846 METHODS 5030 (PURGE AND TRAP) AND 8020 (VOLATILE AROMATICS USING GAS CHROMATOGRAPHY/PID)

The following describes the minimun Quality Control/Quality Assurance which must be performed and reported by the laboratory as described in SW-846. Method 8270, Aromatic Volatile Organics, is the determinative method. Method 5030, Purge and Trap, is the sample preparation and sample introduction method. Attached are Forms 1-6 which when completed comprise a complete analytical report.

I. Required Instrument Quality Control

A. Initial calibration

1. Calibration should follow the procedure given in Section 5.2-5.6 and 7.3 in Method 8020 and 7.4 in Method 8000.

2. Calculate the response factors for each analyte in the calibration standard as described in Sections 7.4.2.3 or 7.4.3.3 in Method 8000.

3. The relative retention times (RRT) of each compound in the calibration standard should be calculated and recorded. Calculate the average RRT times and the standard deviation of the RRT.. Plus or minus three times standard deviation of the RRT is generally used as the RRT window.

4. Record the response Response Factors and the RRT for the initial calibration on Form 2.

B. Daily Calibration

1. On a daily basis the analyst must check the working calibration curve or calibration factor by analyzing one or calibration standards. If any analyte varies by more than plus or minus 15 percent from the response predicted by the initial calibration, then the intial calibration must be redone. The relative retention times of each analyte must also fall within the windows established during the initial calibration.

2. Record the information from the daily calibration check on Form 3.

II. Initial Demonstration of Precision and Accuracy

On a one-time basis, the analyist must demonstrate the ability to generate the ability to generate acceptable accuracy and precision by the following procedure:

A. Prepare and analyze a Quality Control Check sample following sections 8.6.1-8.6.3 in Method 8000.

B. Calculate the average recovery in ug/L and the standard deviation in ug/L for each analyte of interest.

C. For each analyte, compare the average recovery and the standard deviation for each analyte with the corresponding acceptance criteria in Table 3. Calibration and QC Acceptance Criteria in Method 8020. System performance is considered acceptable, and sample anaylses may began, when the acceptance critiria for analytes are met. If any individual precision or accuracy criteria is not met, then system performance is not acceptable for that anaylte.

D. When one of the analytes fails to meet the accuracy or presision criteria, the analyst must do one of the following:

1. Locate and correct the source of the problem and repeat the precision and accuracy demonstration for all analytes beginning with Section 8.6.2 of Method 8000, or

2. Repeat the demonstration only for those analytes that failed the test beginning with Section 8.6.2 of Method 8000.

3. Report the results of the accuracy and precision demonstraion on Form 4.

III. On-going analysis of reagent blank, matrix spike and matrix spike duplicate

A. A reagent blank must be run with each set of samples and must be demonstrated to be free of interferences. Report the results of the blank anaylsis on Form 5.

B. With each analytical batch, not to exceed 20 samples, a matrix spike and a matrix spike duplicate must be prepared and analyzed following the directions in 8.7 of Method 8000.

1. Calculate the acceptance criteria for the accuracy and precision of each analyte using Table 3 or 4 in Method

8020.

2. If any analyte fails the criteria for precision or accuracy, a quality control check standard containing each analyte that failed the criteria must be analyzed as given in Section 8.8 of Method 8000.

3. If the analtye still fails the accuracy and/or presision criteria, the analytical result for that analyte in the unspiked sample is suspect and may not be reported for regulatory purposes.

4. Report the results of the matrix spike and matrix spike duplicate on Form 6.

IV. Acceptable Accuracy and Precision Limits for Surrogates

A. Surrogate spiking solution must be added to each sample following the instructions in Section 5.6 of Method 8020.

B. Calculate the percent recovery (p) and standard deviation (s) of each surrogate. For a given sample matrix, calculate the upper and lower control limits for percent recovery by:

Upper Control Limit(UCL)=p+3s

Lower Control Limit (LCL)=p-3s

C. If the recovery of a surrogate is not within limits, the analyst must:

1. Check to be sure that there are no errors in calculations, surrogate standards, or calibration standards. Check instrument performance.

2. Recalculate data and/or reanalyze extract if any of the above checks reveals a problem.

3. If none of the above are a problem, the sample must be either reextracted and reanalyzed, or the data must be flagged as "estimated concentration."

4. Report surrogate recovery with the sample results on Form 1.

VI. Method Detection Limits (MDLs) and Practical Quantification Limits (PQLs)

Method Detection Limits and Pratical Quantification Limits are listed in Table 1.

Form 1. ORGANIC ANALYSIS DATA SHEET

Sample No.
_____

Laboratory Name: _____
Lab Sample ID No: _____
Sample Matrix: _____
Date Extracted: _____
Date Analyzed: _____
Conc/Dilution Factor: _____

Date Sample Collected: _____
Date Sample Received: _____
Date Reported From Lab: _____
Extraction Method: _____
Analytical Method: _____

Compound	Retention Time	Concentration	Units
Ethylbenzene			
Toluene			
Xylenes			

Form 2. Initial Calibration Data

Laboratory: _____ Method: _____

Date: _____

Internal or External Standards Calibration Procedure: _____

Nanograms:	RF	RRT	RF	RRT	RF	RRT	TF	RRT	RF	RRT	RF	RRT	RF %RSD	Ave RRT
Compound														
Ethylbenzene														
Toluene														
Xylenes														

Form 3. DAILY CALIBRATION CHECK

Laboratory _____ Method _____
Date of Initial Calibration _____
Date of Daily Check _____

	Initial Calibration		Daily Calibration Check		Response Factor % Difference
	RRT Window	Average Response Factor	RRT	Response Factor	
Ethylbenzene					
Toluene					
Xylenes					

Form 4. INITIAL DEMONSTRATION OF ACCURACY, AND PRECISION,

Date Initial Demonstration Performed: _____

Laboratory: _____ Method: _____

Compound	x	QC Limits	s	QC Limits	QC Limits
Ethylbenzene					
Toluene					
Xylenes					

Form 5. METHOD BLANK SUMMARY

Laboratory: _____ Date: _____

Method: _____

Compounds	Concentration (µg/L)
Ethylbenzene	
Toluene	
Xylenes	

Form 6. WATER MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Sample # _____ Laboratory Name: _____ Method: _____

Date: _____ For Samples: _____

Compound	Conc. Spike Added(ug/L)	Sample Result(ug/L)	Concentration Matrix Spike	% Recovery	Concentration Matrix Spike Duplicate	% Recovery	RPD	QC Limits RPD	% Recovery
Ethylbenzene									
Toluene									
Xylenes									

IV.LT.10. Statistical Test

4.3 TOLERANCE INTERVALS BASED ON THE NORMAL DISTRIBUTION

An alternative approach to analysis of variance to determine whether there is statistically significant evidence of contamination is to use tolerance intervals. A tolerance interval is constructed from the data on

(uncontaminated) background wells. The concentrations from compliance wells are then compared with the tolerance interval. With the exception of pH, if the compliance concentrations do not fall in the tolerance interval, this provides statistically significant evidence of contamination.

Tolerance intervals are most appropriate for use at facilities that do not exhibit high degrees of spatial variation between background wells and compliance wells. Facilities that overlie extensive, homogeneous geologic deposits (for example, thick, homogeneous lacustrine clays) that do not naturally display hydrogeochemical variations may be suitable for this statistical method of analysis.

A tolerance interval establishes a concentration range that is constructed to contain a specified proportion of at least P% of the population with a specified confidence coefficient, Y. The proportion of the population included, P, is referred to as the coverage. The probability with which the tolerance interval includes the proportion P% of the population is referred to as the tolerance coefficient.

A coverage of 95% is recommended. If this is used, random observations from the same distribution as the background well data would exceed the upper tolerance limit less than 5% of the time. Similarly, a tolerance coefficient of 95% is recommended. This means that one has a confidence level of 95% that the upper 95% tolerance limit will contain at least 95% of the distribution of observations from background well data. These values were chosen to be consistent with the performance standards described in Section 2. The use of these values corresponds to the selection of α of 5% in the multiple well testing situation.

The procedure can be applied with as few as three observations from the background distribution. However, doing so would result in a large upper tolerance limit. A sample size of eight or more results is an adequate tolerance interval. The minimum sampling schedule called for in the regulations would result in at least four observations from each background well. Only if a single background well is sampled at a single point in time is the sample size so small as to make use of the procedure questionable.

Tolerance intervals can be constructed assuming that the data or the transformed data are normal. Tolerance intervals can also be constructed assuming other distributions. It is also possible to construct nonparametric tolerance intervals using only the assumption that the data came from some continuous population. However, the nonparametric tolerance intervals require such a large number of observations to provide a reasonable coverage and tolerance coefficient that they are impractical in this application.

The range of the concentration data in the background well samples should be considered in determining whether the tolerance interval approach should be used, and if so, what distribution is appropriate. The background well concentration data should be inspected for outliers and tests of normality applied before selecting the tolerance interval approach. Tests of normality were presented in Section 3.2. Note that in this case, the test of normality would be applied to the background well data that are used to construct the

tolerance interval. These data should all be from the same normal distribution.

In this application, unless pH is being monitored, a one-sided tolerance interval or an upper tolerance limit is desired, since contamination is indicated by large concentrations of the hazardous constituents monitored. Thus, for concentrations, the appropriate tolerance interval is (0, TL), with the comparison of importance being the larger limit, TL.

PURPOSE

The purpose of the tolerance interval approach is to define a concentration range from background well data, within which a large proportion of the monitoring observations should fall with high probability. Once this is done, data from compliance wells can be checked for evidence of contamination by simply determining whether they fall in the tolerance interval. If they do not, this is evidence of contamination.

In this case the data are assumed to be approximately normally distributed. Section 3.2 provided methods to check for normality. If the data are not normal, take the natural logarithm of the data and see if the transformed data are approximately normal. If so, this method can be used on the logarithms of the data. Otherwise, seek the assistance of a professional statistician.

PROCEDURE

Step 1. Calculate the mean, $\bar{X}$, and the standard deviation, S, from the background well data.

Step 2. Construct the one-sided upper tolerance limit as

$$TL = \bar{X} + K\,S,$$

where K is the one-sided normal tolerance factor found in Table 5, Appendix B.

Step 3. Compare each observation from compliance wells to the tolerance limit found in Step 2. If any observation exceeds the tolerance limit, that is statistically significant evidence that the well is contaminated. Note that if the tolerance interval was constructed on the logarithms of the original background observations, the logarithms of the compliance well observations should be compared to the tolerance limit. Alternatively the tolerance limit may be transferred to the original data scale by taking the antilogarithm.

REFERENCE

Lieberman, Gerald J. 1958. "Tables for One-sided Statistical Tolerance Limits." *Industrial Quality Control*. Vol. XIV, No. 10.

EXAMPLE

Table 4-5 contains example data that represent lead concentration levels in parts per million in water samples at a hypothetical facility. The background well data are in columns one and two, while the other four columns represent compliance well data.

Step 1. The mean and standard deviation of the n = 8 observations have been calculated for the background well. The mean is 51.4 and the standard deviation is 16.3.

Step 2. The tolerance factor for a one-sided normal tolerance interval is found from Table 5, Appendix B as 3.188. This is for 95% coverage with probability 95% and for n = 8. The upper tolerance limit is then calculated as 51.4 + (3.188)(16.3) = 103.4.

Step 3. The tolerance limit of 103.3 is compared with the compliance well data. Any value that exceeds the tolerance limit indicates evidence of contamination. Two observations from Well 1, two observations from Well 3, and all four observations from Well 4 exceed the tolerance limit. Thus there is evidence of contamination at Wells 1, 3, and 4.

INTERPRETATION

A tolerance limit with 95% coverage gives an upper bound below which 95% of the observations of the distribution should fall. The tolerance coefficient used here is 95%, implying that at least 95% of the observations should fall below the tolerance limit with probability 95%, if the compliance well data come from the same distribution as the background data. In other words, in this example, we are 95% certain that 95% of the background lead concentrations are below 104 ppm. If observations exceed the tolerance limit, this is evidence that the compliance well data are not from the same distribution, but rather are from a distribution with higher concentrations. This is interpreted as evidence of contamination.

4.4 PREDICTION INTERVALS

A prediction interval is a statistical interval calculated to include one or more future observations from the same population with a specified confidence. In ground-water monitoring, a prediction interval approach may be used to make comparisons between background and compliance well data. The concentrations of a hazardous constituent in the background wells are used to establish an interval within which K future observations from the same population are expected to lie with a specified confidence. Then each of K future observations of compliance well concentrations is compared to the prediction interval. The interval is constructed to contain all of K future observations with the stated confidence. If any future observation exceeds the prediction interval, this is statistically significant evidence of contamination. In application, the number of future observations to be collected, K, must be specified. Thus, the prediction interval is constructed for a specified time period in the future. One year is suggested. The interval can be constructed either to contain all K individual observations with a specified probability, or to contain the K' means observed at the K' sampling periods.

TABLE 5. TOLERANCE FACTORS (K) FOR ONE-SIDED NORMAL TOLERANCE INTERVALS WITH PROBABILITY LEVEL (CONFIDENCE FACTOR) Y = 0.95 AND COVERAGE P = 95%

n	K	n	K
3	7.655	75	1.972
4	5.145	100	1.924
5	4.202	125	1.891
6	3.707	150	1.868
7	3.399	175	1.850
8	3.188	200	1.836
9	3.031	225	1.824
10	2.911	250	1.814
11	2.815	275	1.806
12	2.736	300	1.799
13	2.670	325	1.792
14	2.614	350	1.787
15	2.566	375	1.782
16	2.523	400	1.777
17	2.486	425	1.773
18	2.543	450	1.769
19	2.423	475	1.766
20	2.396	500	1.763
21	2.371	525	1.760
22	2.350	550	1.757
23	2.329	575	1.754
24	2.309	600	1.752
25	2.292	625	1.750
30	2.220	650	1.748
35	2.166	675	1.746
40	2.126	700	1.744
45	2.092	725	1.742
50	2.065	750	1.740
		775	1.739
		800	1.737
		825	0.736
		850	1.734
		875	1.733
		900	1.732
		925	1.731
		950	1.729
		975	1.728
		1000	1.727

SOURCE: (a) for sample sizes ≤ 50: Lieberman, Gerald F. 1958. "Tables for One-sided Statistical Tolerance Limits." *Industrial Quality Control.* Vol. XIV, No. 10. (b) for sample sizes ≥ 50: K values were calculated from large sample approximation.

IV.LT.11. Gas Chromatography/Mass Spectrometry
QA/QC data requirements

QUALITY CONTROL/QUALITY ASSURANCE REQUIREMENTS FOR GAS CHROMATOGRAPHY/ MASS SPECTROMETRY ANALYSIS OF PRINCIPAL HAZARDOUS CONSTITUENTS IN GROUND WATER BY SW-846, METHOD 8270

I. Required Instrument Quality Control
A. Tuning
B. Initial calibration of GC/MS
c. Daily calibration

II. Initial Demonstration of Precision and Accuracy

III. On-Going Analysis of Reagent Blank, Matrix Spike, and Matrix Spike Duplicate

IV. Acceptable Accuracy and Precision Limits for Surrogates

V. Verification

VI. Method Detection Limits and Practical Quantification Limits

Table 1. Method Detection Limits and Practical Quantification Limits for Principal Hazardous Constituents

Form 1. Organic Analysis Data Sheet
Form 2. GC/MS Tuning and Mass Calibration
Form 3. Initial Calibration Data
Form 4. Daily Calibration Check
Form 5. Initial Demonstration of Accuracy and Precision
Form 6. Method Blank Summary
Form 7. Water Matrix Spike/Matrix Spike Duplicate Recovery

QUALITY CONTROL/QUALITY ASSURANCE REQUIREMENTS FOR GC/MS ANALYSIS OF PRINCIPAL HAZARDOUS CONSTITUENTS

The following describes the minimum Quality Control/Quality Assurance which must be performed and reported by the laboratory as described in SW-846, Method 8270. Attached are Forms 1-7 which when completed comprise a complete analytical report, including sample results (Form 1).

I. Required Instrument Quality Control

A. Tuning

1. The GC/MS system must be capable of producing a mass spectrum of decafluorotriphenylphosphine (DFTPP) which meets all of the criteria of Method 8270, Table 3, when the procedures in 4.1.3 and 7.3.2 of the method are followed.

2. During each working day, prior to analysis of samples, the analyst must demonstrate that the tuning requirements have been met. Results of the tuning are to be reported on Form 2.

B. Initial Calibration of GC/MS

1. Calibration should follow the procedure given in 5.4 and 7.3 of Method 8270.

2. Before an initial calibration curve is produced, a system performance check must be make to ensure that minimum average Response Factors (RF) are met. The System Performance Check Compounds (SPCC) for semi-volatiles are N-nitroso-di-n-propylamine, hexachlorocyclopentadiene, 2,4-dinitrophenol, and 4-nitrophenol. The minimum acceptable RF for any of these compounds in 0.050.

3. Calculate the response factors for each analyte in the calibration standard as described in 7.3.3 of Method 8270.

4. Calculate the average RF and the percent relative standard deviation (%RSD) for each compound as described in 7.3.4 of Method 8370. The %RSD should be less than 30% for each compound. Record on Form 3.

5. The relative retention times of each compound in the calibration run should be calculated and recorded. See Sections 5.2 and 7.3.2 of Method 8270 for the use of appopriate internal standards. The RRT of each compound in each calibration should agree within 0.06 relative retention units. Record the average RRT for each analyte on Form 3.

6. Using Form 3, report the above calibration information for the curve used when the sample analyses was performed.

C. Daily Calibration

1. Once every daily working period, a SPCC standard must be run to establish that minimum RFs are met.

2. A Calibration Check Compound (CCC) standard at mid-level concentration containing all of the compounds, including surrogates, must be run on a daily basis.

3. If the %Difference, as defined in 7.4.4, for each CCC is less than or equal to 30%, then the initial calibration is assumed to be valid, and analysis of samples may begin.

4. If the % Difference for any CCC if > 30%, then corrective action must be taken. If the problem cannot be isolated and solved, then a new five-point calibration curve must be generated before sample analysis begins.

5. Internal standard (5.2) responses and retention times in the calibration check standard must be evaluated immediately.

6. Record daily calibration check information on Form 4.

II. Initial Demonstration of Precision and Accuracy

On a one-time basis, the analyist must demonstrate the ability to generate

acceptable accuracy and precision by following this procedure:

A. Prepare and analyze a Quality Control Check (QCC) sample following the instructions in Sections 8.5.1-8.5.3 of Method 8270.

B. Calculate the average percent recovery ($\bar{x}$) in ug/L and standard deviation (s) for each analyte.

C. Compare $\bar{x}$ and s with corresponding acceptance criteria for presision and accuracy with those in Table 6.

D. If all $\bar{x}$s and s meet acceptance criteria, system performance is acceptable, and analysis of actual samples may begin.

E. If one or more analyte fails the test, proceed according to the instructions in 8.5.6 or 8.5.6.2.

F. Report results of the accuracy and precision demonstration on Form 5.

III. On-going analysis of reagent blank, matrix spike and matrix spike duplicate

A. A reagent blank must be run with each set of samples and must be demonstrated to be free of interferences. Report the result of the blank analysis on Form 6.

B. With each analytical batch a matrix spike and a matrix spike duplicate must be prepared following instructions in 8.6 of Method 8270. For laboratories analyzing 1-10 samples per month, at least one matrix spike and matrix spike duplicate must be analyzed per month.

1. Calculate the acceptance criteria for the accuracy and precision of each analyte using the equations in 8.6.3 and Table 7 of Method 8270.

2. If any analyte fails the criteria for accuracy and precision, a quality control check standard containing each analyte that failed the criteria must by analyzed in Section 8.7.

3. If the analyte still fails the acuracy and preicision criteria, the analytical result for that analyte in the unspiked sample is suspect, and may not be reported for regulatory purposes.

4. After five spiked samples of the same matrix have been analyzed, calculate percent recovery (p) and standard deviation(sp). Accuracy assessment for that matrix may then be expressed and precision assessment for each analyte on a regular basis.

5. Report the results of the matrix spike and matrix spike duplicate on Form 7.

IV. Acceptable Accuracy and Precision Limits for Surrogates

A. Surrogate spiking solution must be added to each sample following instructions in 5.5. Calculate the percent recovery of each surrogate sample by sample.

B. When a minimun of 30 samples of the same matrix have been analyzed, calculate the average percent recovery (p) and standard deviation (s) for each surrogate.

C. Calculate upper and lower control limits, for a given matrix:

UCL-p+3s
LCL-p-3s

D. If a surrogate in a sample is not within limits, the analyst has four options:

1. Check for errors

2. Reanalyze extract

3. Reextract and reanalyze sample

4. Flag data as "estimated concentration"

E. Report surrogate recovery with the sample results on Form 1.

V. Verification

In order to verify a compound indentification in a sample, two criteria must be met:

A. Relative Retention Time (RRT)

RRT of the compound in the sample must compare to the average RRT of the calibration standards by $\pm$ 0.06 RRT units.

B. Mass Spectrum

1. The sample component must correspond to the standard component mass spectrum.

2. Within the same daily working period that the sample analysis is performed, a mass spectrum for the standard reference material must be obtained on the user's GC/MS. Calibration standards' mass spectrum may be used for this.

3. All ions present in the standard mass spectrum at relative intensities of more than 10% must be present in the sample spectrum.

4. Relative ion intensities must agree within $\pm$20%.

C. Verification by RRT must be reported on Form 1 with sample results. Verification by mass spectrum must be presented by including the mass spectrum of the sample component and standard or by tabulation of matching ions.

D. Identification of compounds not in calibration standards

1. The user's computer library of mass spectra may be used to identify compounds not present in the calibration standards.

a. Ions present at greater than 10% must be present in sample spectrum.

b. Relative intensities of ions greater than 10 % must agree within ±20%.

c. Molecular ions present in the reference spectrum should be present in the sample spectrum.

2. An estimate of concentrations of non-calibration compounds can be done using the procedure in 7.6.2.3.

3. Tentative identification and an estimate of their concentration of all non-calibrated compounds must be reported on Form 1, sample results.

VI. Method Detection Limits and Practical Quantification Limits

Method Detection Limits (MDLs) and Practical Quantification Limits (PQLs) are listed in Table 1. All identified compounds detected at a level of 10 ug/L must be quantified. Compounds detected at levels between the MDL and the PQL must be reported but quantification in this range is at the discretion of the laboratory. For those compounds below the PQLs listed in Table 1, that the laboratory does not quantify, the term "detected, but not quantified" should be reported in the concentration column of Form 1.

METHOD DETECTION LIMITS AND PRACTICAL QUANTIFICATION LIMITS FOR PRINCIPAL HAZARDOUS CONSTITUENTS BY GC/MS (ug/L)

Compound	MDLs by EPA Method 625	PQLs by 8270
Naphthalene	1.6	10
Acenaphthylene	3.5	10
Acenaphthene	1.9	10
Fluorene	1.9	10
Phenanthrene	5.4	10
Anthracene	1.9	10
Fluoranthene	2.2	10
Pyrene	1.9	10
Benzo(a)anthracene	7.8	10
Chrysene	2.5	10
Benzo(b)fluoranthene	4.8	10
Benzo(k)fluoranthene	2.5	10
Benzo(a)pyrene	2.5	10
Benzo(ghi)perylene	4.1	10
Dibenzo(ah)anthracene	2.5	10
Indeno(123-cd)pyrene	3.7	10

Form 1. ORGANIC ANALYSIS DATA SHEET

Sample No.
_____

Laboratory Name: _____
Lab Sample ID No: _____
Sample Matrix: _____
Date Extracted: _____
Date Analyzed: _____
Conc/Dilution Factor: _____

Date Sample Collected: _____
Date Sample Received: _____
Date Reported From Lab: _____
Extraction Method: _____
Analytical Method: _____

Compound	Retention Time	Concentration	Units
Naphthalene			
Acenaphthylene			
Acenaphthene			
Fluorene			
Phenanthrene			
Anthracene			
Fluoranthene			
Pyrene			
Benzo(a)anthracene			
Chrysene			
Benzo(b)fluoranthene			
Benzo(k)fluoranthene			
Benzo(a)pyrene			
Benzo(ghi)perylene			
Dibenzo(ah)anthracene			
Indeno(1,2,3-cd)pyrene			

Form 1a. ORGANIC ANALYSIS DATA SHEET CONTINUED

Sample No.
_____

Noncalibration Compounds Detected	Estimated Concentration

Surrogate Recovery

Surrogate Compound	% Recovery	QC Limits Lower Control Limit	QC Limits Upper Control Limit

Form 2.

GC/MS TUNING AND MASS CALIBRATION
DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Laboratory Name _____

Instrument ID _____ Date _____ Time _____

Data Release Authorized by: _____

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 ·60.0% of mass 198	
68	less tan 2.0% of mass 69	[ ][1]
69	mass 69 relative abundance	
70	less than 2.0% of mass 69	[ ][1]
127	40.0 ·60.0% of mass 198	
197	less than 1.0% of mass 198	
198	base peak, 100% relative abundance	
199	5.0·9.0% of mass 198	
275	10.0·30.0% of mass 198	
365	greater than 1.00% of mass 198	
441	present, but less than mass 443	
442	greater than 40.0% of mass 198	
443	17.0·23.0% of mass 442	[ ][2]

THIS PERFORMANCE TUNE APPLIES TO THE FOLLOWING SAMPLES, BLANKS AND STANDARDS.

[1]Value in parenthesis is % mass 69.
[2]Value in parenthesis is % mass 442.

SAMPLE ID	LAB ID	DATE OF ANALYSIS	TIME OF ANALYSIS

Form 3. Initial Calibration Data

Laboratory: _____ Method: _____

Date: _____

Internal or External Standards Calibration Procedure: _____

Nanograms:	RF/RRT	RF/RRT	RF/RRT	RF/RRT	RF/RRT	RF/RRT	RF %RSD	AVE RRT
Compound								
Naphthalene								
Acenaphthylene								
Acenaphthene								
Fluorene								
Phenanthrene								
Anthracene								
Fluoranthene								
Pyrene								
Benzo(a)anthracene								
Chrysene								
Benzo(b)fluoranthene								
Benzo(k)fluoranthene								
Benzo(a)pyrene								
Benzo(ghi)Perylene								
Dibenzo(ah)anthracene								
Indeno(123-cd)pyrene								

Form 3. INITIAL CALIBRATION CONTINUED

System Performance Check Compounds	Response Factors
N-nitroso-di-n-propylamine	_____
hexachlorocyclopentadiene	_____
2,4-Dinitrophenol	_____
4-Nitrophenol	_____

Form 4. DAILY CALIBRATION CHECK

Laboratory _____ Method _____
Date of Initial Calibration _____
Date of Daily Check _____

System Performance Check Compounds — Response Factors

N-nitroso-di-n-propylamine _____
hexachlorocyclopentadiene _____
2,4-Dinitrophenol _____
4-Nitrophenol _____

	Initial Calibration		Daily Calibration Check		Response Factor % Difference
	RRT Window	Average Response Factor	RRT	Response Factor	
Naphthalene					
Acenaphthylene					
Fluorene					
Phenanthrene					
Anthracene					
Fluoranthene					
Pyrene					
Benzo(a)anthracene					
Chrysene					
Benzo(b)fluoranthene					
Benzo(k)fluoranthene					
Benzo(a)pyrene					
Benzo(g,h,i)perylene					
Dibenzo(a,h)anthracene					
Indeno(1,2,3-cd)pyrene					

Daily Calibration Check for Samples: _____

Form 5. INITIAL DEMONSTRATION OF ACCURACY, AND PRECISION,

Date Initial Demonstration Performed: _____

Laboratory: _____ Method: _____

Compound	$\bar{x}$	QC Limits	s	QC Limits	QC Limits
Naphthalene					
Acenaphthylene					
Acenaphthene					
Fluorene					
Phenanthrene					
Anthracene					
Fluoranthene					
Pyrene					
Benzo(a)anthracene					
Chrysene					
Benzo(b)fluoranthene					
Benzo(k)fluoranthene					
Bezo(a)pyrene					
Benzo(g,h,i)Perylene					
Dibenzo(a,h)anthracene					
Indeno(1,2,3-cd)pyrene					

Form 6. METHOD BLANK SUMMARY

Laboratory: _____ Date: _____

Method: _____

Compounds	Concentration (µg/L)
Naphthalene	
Acenaphthylene	
Acenaphthene	
Fluorene	
Phenanthrene	
Anthracene	
Fluoranthene	
Pyrene	
Benzo(a)anthracene	
Chrysene	
Benzo(b)fluoranthene	
Benzo(k)fluoranthene	
Benzo(a)pyrene	
Benzo(ghi)Perylene	
Dibenzo(ah)anthracene	
Indeno(1,2,3-cd)pyrene	

Method Blank Summary for Samples: _____

Form 7. WATER MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Sample # _____ Laboratory Name: _____ Method: _____

Date: _____ For Samples: _____

Compound	Conc. Spike Added(ug/L)	Sample Result(ug/L)	Concentration Matrix Spike	% Recovery	Concentration Matrix Spike Duplicate	% Recovery	RPD	QC Limits RPD	QC Limits % Recovery
Naphthalene									
Acenaphthylene									
Acenaphthene									
Fluorene									
Phenanthrene									
Anthracene									
Fluoranthene									
Pyrene									
Benzo(a)anthracene									
Chrysene									
Benzo(b)fluoranthene									
Benzo(k)fluoranthene									
Benzo(a)pyrene									
Benzo(ghi)Perylene									
Dibenzo(ah)anthracene									
Indeno(123-cd)pyrene									

MODULE V

CLOSURE/POST-CLOSURE

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CLOSURE/POST-CLOSURE

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MODULE V -- CLOSURE/POST-CLOSURE

A. APPLICABILITY

1. The requirements of this module shall pertain to the waste pile and land treatment unit defined in Permit Condition II.A.

2. Facility closure shall commence:

   a. Upon direction of the Department for violation of the permit, ARM Rules or state statutes;

   b. Upon suspension, cancellation, or revocation of the terms and conditions of this permit concerning the authorization to store or treat waste materials;

   c. Upon abandonment of the site;

   d. Upon direction of the Department for failure to secure and maintain adequate financial assurance as required in Condition V.N.; or

   e. When necessary to comply with Permit Module III.

B. CLOSURE PERFORMANCE STANDARD

The Permittee shall close the waste pile and the land treatment unit in a manner that:

1. Minimizes the need for further maintenance; and

2. Controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition

products to the ground or surface waters or to the atmosphere; and

3. Complies with the closure requirements of this Module including, but not limited to, requirements specified in Permit Modules III and IV.

C. AMENDMENT OF PLAN

The Permittee shall submit a written request in compliance with ARM 16.44.116 for a permit modification to authorize a change in operating plans, facility design, or the approved closure plan for the waste pile or land treatment unit in accordance with the procedures in Title 16, Chapter 44, Subchapters 1 and 9, ARM. The written request shall include a copy of the amended closure and/or post-closure care plans for approval by the Department.

1. The Permittee may submit a written request to the Department for a permit modification to amend the closure and/or post-closure plans at any time prior to the notification of partial or final closure of the facility.

2. The Permittee shall submit a written request for a permit modification to authorize a change in the approved closure and/or post-closure plans whenever:

   a. Changes in operating plans or facility design affect the closure and/or post-closure plans;

   b. There is a change in the expected year of closure, if applicable;

   c. In conducting partial or final closure activities, unexpected events require a modification of the approved closure plan;

products to the ground or surface waters or to the atmosphere; and

3. Complies with the closure requirements of this Module including, but not limited to, requirements specified in Permit Modules III and IV.

C. AMENDMENT OF PLAN

The Permittee shall submit a written request in compliance with ARM 16.44.116 for a permit modification to authorize a change in operating plans, facility design, or the approved closure plan for the waste pile or land treatment unit in accordance with the procedures in Title 16, Chapter 44, Subchapters 1 and 9, ARM. The written request shall include a copy of the amended closure and/or post-closure care plans for approval by the Department.

1. The Permittee may submit a written request to the Department for a permit modification to amend the closure and/or post-closure plans at any time prior to the notification of partial or final closure of the facility.

2. The Permittee shall submit a written request for a permit modification to authorize a change in the approved closure and/or post-closure plans whenever:

   a. Changes in operating plans or facility design affect the closure and/or post-closure plans;

   b. There is a change in the expected year of closure, if applicable;

   c. In conducting partial or final closure activities, unexpected events require a modification of the approved closure plan;

d. Events occur during the active life of the facility, including partial and final closures, which affect the approved post-closure plan; or

e. Requested by the Department under the conditions described in Conditions V.C.2.a-d above.

3. The Permittee shall submit a written request for a permit modification including a copy of the amended closure plan and revised cost estimates as required under Condition V.M.2. for approval at least 60 days prior to the proposed change in facility design or operation, or no later than 60 days after an unexpected event has occurred which has affected the closure plan. If an unexpected event occurs during the partial or final closure period, the Permittee shall request a permit modification no later than 30 days after the unexpected event. The Department will approve, disapprove, or modify this amended plan in accordance with the procedures in Title 16, Chapter 44, Subchapters 1 and 9, ARM. The approved closure plan will become a condition of this Permit.

4. The Department may request modifications to the plan under the conditions described under C.2. of this Module. The Permittee shall submit the modified plan within 60 days of the Department's request, or within 30 days if the change in facility conditions occurs during partial or final closure. Any modifications requested by the Department will be approved in accordance with the procedures in Title 16, Chapter 44, Subchapters 1 and 9, ARM.

D. NOTIFICATION OF PARTIAL CLOSURE AND FINAL CLOSURE

1. The Permittee shall notify the Department in writing at least 60 days prior to the date on which he or she expects to begin closure of a regulated unit, or final closure of a facility with such a unit.

2. The date when the Permittee "expects to begin closure" shall be either no later than 90 days after the final volume of hazardous wastes or, if there is a reasonable possibility that the waste pile will receive additional hazardous waste, no later than one year after the date on which the waste pile received the most recent volume of hazardous waste. If the Permittee can demonstrate to the Department that the waste pile has the capacity to receive additional hazardous wastes and the Permittee has taken, and will continue to take, all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements in Modules III and IV, the Department may approve an extension to this one-year limit. Under no conditions shall initiation of closure extend beyond November 1, 1995.

3. If this facility's permit is terminated, or if the Permittee is otherwise ordered, by judicial decree or final order under 75-10-413, MCA, to cease receiving hazardous wastes or to close, then the requirements of this paragraph do not apply. However, the Permittee shall close the facility in accordance with the deadlines established in Condition F of this Module.

E. REMOVAL OF WASTES AND DECONTAMINATION OR DISMANTLING OF EQUIPMENT

Nothing in this Module shall preclude the Permittee from removing hazardous wastes and decontaminating or dismantling equipment in accordance with the approved partial or final closure plan at any time before or after notification of partial or final closure.

F. CLOSURE SCHEDULE

1. The Permittee must complete final closure activities for the waste pile in accordance with Permit Module III and IV and for

the land treatment unit in accordance with Permit Module III.LT. and IV.LT. and the following:

a. Within 90 days after receiving the final volume of hazardous wastes at the waste pile, the Permittee must remove from the unit and treat or dispose of all hazardous wastes in accordance with the closure plan outlined in Permit Module III.

b. The Permittee must complete partial or final closure activities in accordance with the approved closure plan outlined in Permit Module II and within 180 days after receiving the final volume of hazardous waste at the waste pile.

2. The Department may approve an extension to the closure period if the Permittee complies with all applicable requirements for requesting a modification to the Permit and demonstrates that:

a. The partial or final closure activities will, of necessity, take longer than the time period stipulated in this Permit to complete; or

b. i. The hazardous waste management units have the capacity to receive additional hazardous wastes; and

ii. There is reasonable likelihood that the Permittee will recommence operation of the hazardous waste management units within one year; and

iii. Closure of the hazardous waste management units would be incompatible with continued operation of the site; and

c. The Permittee has taken and will continue to take all steps to prevent threats to human health and the

environment from the unclosed but not operating hazardous waste management units, including compliance with all applicable permit requirements.

3. The demonstrations for the waste pile referred to in Permit Conditions V.F.1. and 2., shall be made as follows: (a) The demonstrations in paragraph 1 shall be made at least 30 days prior to the expiration of the closure period stipulated in Permit Module III.

G. DISPOSAL OR DECONTAMINATION OF EQUIPMENT, STRUCTURES AND SOILS

During the closure period, all contaminated equipment, structures, and soils shall be properly disposed of or decontaminated, unless otherwise specified in Permit Module III and III.LT. By removing any hazardous wastes or hazardous constituents during closure, the Permittee may become a generator of hazardous waste and shall handle that waste in accordance with all applicable requirements of Title 16, Chapter 44, Subchapter 4.

H. CERTIFICATION OF CLOSURE

Within 60 days of completion of closure of each hazardous waste management unit identified in Condition II.A., the Permittee shall submit to the Department, by registered mail, a certification that the hazardous waste management units have been closed in accordance with the specification in the approved closure plan. The certification shall be signed by the Permittee and by an independent registered professional engineer for the waste pile and by an independent, qualified soil scientist for the land treatment unit. Documentation supporting the independent registered professional engineer's and the soil scientist's certification shall be furnished to the Department upon request until the Permittee is released from the financial assurance requirements for closure under Permit Condition V.N.

I. SURVEY PLAT

No later than the submission of the certification of closure, the Permittee shall submit to the local zoning authority, or the authority with jurisdiction over local land use, and to the Department, and to the county planner or equivalent, a survey plat indicating the location and dimension of each hazardous waste management unit with respect to permanently surveyed benchmarks. This plat shall be prepared and certified by a professional land surveyor. The plat filed with the local zoning authority, or the authority with jurisdiction over local land use, shall contain a note prominently displayed, which states the Permittee's obligation to restrict disturbance of the hazardous waste disposal unit in accordance with Permit Condition III and III.LT. The plat and disturbance restriction notice shall also be attached to all instruments of conveyance such as deeds or contracts for deeds.

J. POST-CLOSURE CARE AND USE OF PROPERTY

1. a. Post-closure care shall begin after completion of closure of the unit and continue for 30 years after that date and shall consist of the monitoring and reporting requirements specified in Permit Modules III, III.LT., and IV, IV.LT. and

   b. Any time preceding partial closure of a hazardous waste management unit subject to post-closure care requirements or final closure, or any time during the post-closure period, the Department may, in accordance with the permit modification procedures in Title 16, Chapter 44, Subchapters 1 and 9, ARM:

      i. Shorten the post-closure care period applicable to the hazardous waste management unit if the Department finds that the reduced period is sufficient to protect human health and the environment (e.g., soils or

groundwater monitoring results, characteristics of the hazardous wastes, application of advanced technology, or alternative disposal, treatment, or re-use techniques indicate that the hazardous waste management unit is secure); or

ii. Extend the post-closure care period applicable to the hazardous waste management unit if the Department finds that the extended period is necessary to protect human health and the environment (e.g. if the compliance groundwater monitoring period extends into the post-closure care period).

2. The Department may require, at partial and final closure, continuation of any of the security requirements of Permit Condition II.D. during part or all of the post-closure period when:

   a. Hazardous wastes may remain exposed after completion of partial or final closure; or

   b. Access by the public or domestic livestock may pose a hazard to human health.

3. Post-closure use of property on or in which hazardous wastes remain after partial or final closure shall never be allowed to disturb the integrity of the final cover or any other components of the containment system, or the function of the unit's monitoring systems, unless the Department finds that the disturbance:

   a. Is necessary to the proposed use of the property, and will not increase the potential hazard to human health or the environment; or

b. Is necessary to reduce a threat to human health or the environment.

4. All post-closure care activities shall be in accordance with the provisions of the approved post-closure plan as specified in Permit Conditions III.O., III.LT.N., IV.I., IV.LT.H. and V.K.

K. POST-CLOSURE PLAN

1. Written Plan

a. The Permittee must comply with the Post-closure plan outlined in Conditions III.O., III.LT.N., IV.I., and IV.LT.H. of this Permit.

b. Personnel listed in Attachment V.1. shall be the contact(s) concerning the hazardous waste disposal unit or facility during the post-closure care period.

2. Until final closure of each land treatment unit, a copy of the approved post-closure plan shall be furnished to the Department upon request, including request by mail. After final closure has been certified, the office specified in Condition V.K.1.b. shall keep the approved post-closure plan during the remainder of the post-closure period.

3. Amendment of plan

The Permittee may request a permit modification in compliance with ARM 16.44.6 to authorize a change in the approved post-closure plan in accordance with the applicable requirements of Title 16, Chapter 44, Subchapters 1 and 9. The written request shall include a copy of the amended post-closure plan for approval by the Department.

a. The Permittee may submit a written request to the Department for a permit modification to amend the post-closure plan at any time during the active life of a hazardous waste management unit or during the post-closure care period.

b. The Permittee shall submit a written request for a permit modification to authorize a change in the approved post-closure plan whenever:

   i. Changes in operating plans or facility design affect the approved post-closure plan, or

   ii. There is a change in the expected year of final closure, if applicable, or

   iii. Events which occur during the active life of the facility, including partial and final closures, affect the approved post-closure plan.

c. The Permittee shall submit a written request for a permit modification at least 60 days prior to the proposed change in facility design or operation, or no later than 60 days after an unexpected event has occurred which has affected the post-closure plan.

d. The Department may request modifications to the plan under Conditions K.3.b. of this Module. The Permittee shall submit the modified plan no later than 90 days after the Department's request. Any modifications requested by the Department will be approved, disapproved, or modified in accordance with the procedures in Title 16, Chapter 44, ARM.

L. POST-CLOSURE NOTICES

1. No later than 60 days after certification of closure of the hazardous waste pile, the Permittee shall submit to the local zoning authority, or the authority with jurisdiction over local land use, and to the Department a record of the type, location, and quantity of hazardous wastes disposed of within each cell or other disposal unit of the facility. For hazardous wastes disposed of before January 12, 1981, the Permittee shall identify the type, location, and quantity of the hazardous wastes to the best of his/her knowledge and in accordance with any records that have been kept.

2. Within 60 days of certification of closure of the last land treatment area, the Permittee must:

   a. Record a notation on the deed to the facility property that will in perpetuity notify any potential purchaser of the property that:

      i. The land has been used to manage hazardous wastes; and

      ii. Its use is restricted under Permit Module III.LT; and

      iii. The survey plat and record of the type, location, and quantity of hazardous wastes disposed of within the waste pile have been filed with the local zoning authority or the authority with jurisdiction over local land use and with the Department; and

   b. Submit a certification, signed by the Permittee, that he or she has recorded the notation specified in Permit Condition V.I., including a copy of the document in which the notation has been placed, to the Department.

3. If the Permittee or any subsequent Permittee of the land upon which a hazardous waste disposal unit is located wishes to remove hazardous wastes, hazardous waste residues, or contaminated soils, he or she shall request a modification to the post-closure permit in accordance with the applicable requirements in Title 16, Chapter 44, Subchapters 1 and 9, ARM. The Permittee shall demonstrate that the removal of hazardous wastes will satisfy the criteria of Condition J.3. of this Module. By removing hazardous waste, the Permittee may become a generator of hazardous waste and shall manage it in accordance with all applicable requirements of Title 16, Chapter 44, Subchapter 4. If the Permittee is granted a permit modification or otherwise granted approval to conduct such removal activities, the Permittee may request that the Department approve either:

   a. The removal of the notation on the deed to the facility property or other instrument normally examined during title search; or

   b. The addition of a notation to the deed or instrument indicating the removal of the hazardous waste.

M. COST ESTIMATE FOR CLOSURE AND POST-CLOSURE CARE

1. The Permittee must adjust the closure and post-closure care cost estimate for inflation within 30 days after the close of the fiscal year for Burlington Northern Railroad. This annual inflation adjustment shall:

   a. be subject to the permit modification requirements of ARM 16.44.118;

   b. be calculated using the procedure outlined in ARM 16.44.804.

2. The Permittee must revise the closure or post-closure care cost estimate no later than 30 days after the Department has approved a request to modify the closure or post-closure care plan respectively. This condition is subject to the permit modification requirements of Permit Condition V.C. and ARM 16.44.116. The revised closure or post-closure care cost estimate must be adjusted for inflation as specified in Permit Condition V.M.

3. The Permittee must keep at the facility the latest closure and post-closure care cost estimate.

N. FINANCIAL ASSURANCE FOR CLOSURE/POST-CLOSURE

The Permittee shall demonstrate continuous compliance with ARM 16.44.815 by providing documentation of financial assurance, as required by ARM 16.44.823 in at least the amount of the cost estimates required by Permit Condition V.M. Changes in the financial assurance mechanism must be approved by the Department.

Attachments

Module V

Closure/Post-Closure

List of Attachments
Module V -- Closure/Post-Closure

Attachment V.1. Post-Closure Care Facility Contact

ATTACHMENT V.1.

Post-Closure Care Facility Contact

Attachment V.1.

Personnel in the office of:

Melvin L. Burda
Manager, Environmental Projects
Burlington Northern Railroad
9401 Indian Creek Parkway
Overland Park, Kansas 66212
(913) 661-4439

DEPARTMENT OF
HEALTH AND ENVIRONMENTAL SCIENCES

STAN STEPHENS, GOVERNOR

COGSWELL BUILDING

STATE OF MONTANA

FAX # (406) 444-2606

HELENA, MONTANA 59620

Solid and Hazardous Waste Bureau
(406) 444-2821

To: Holders of copies of the final Montana Hazardous Waste Permit No. MTHWP-88-03, Modification No.1

From: Rosemary Rowe, RCRA Permit Section RR

Date: July 21, 1989

PERMIT MODIFICATIONS

Attached are replacement pages for minor modifications to the final BN Paradise permit modification. Conditions III.LT. F.3.e., III.LT.J.11. and III.LT.J.12 serve to clarify the relation of items in the Burlington Northern/Clark Fork Coalition agreement to the permit. Typographical errors were corrected in Condition III.LT.N.1.b.i. and Attachment III.LT.5. One set of pages shows the changes make with dashes for deletions and underlines for additions. The other set is a clean copy. Please replace the appropriate pages in your copy of the permit.

accordance with Condition J.7.b.iii. of this Module. If the criteria in Attachment III.LT.2. are exceeded, the Permittee may only place wastes on the areas for which the metals concentrations are less than or equal to the in-soil limits for Paradise wastes only.

e. For the purposes of demonstrating that a life of facility loading rate greater than 80 tons/acre may be acceptable, the Permittee is allowed to make the following demonstration:

i. The Permittee is allowed to set up a demonstration plot within the permitted land treatment area, not to exceed 50 feet by 50 feet in size, or in the LTD demonstration plots.

ii. Although the 5% benzene extractable loading in this plot cannot be exceeded at any point in time, wastes can be experimentally applied at rates exceeding 80 tons/acre, for the 1989 application season.

iii. Based on the results of degradation and constituent migration evaluations for the demonstration plot, the Department may determine, for subsequent application seasons, that the land treatment unit can be loaded at a rate greater than 80 tons/acre.

iv. If such a demonstration is to be conducted, the Permittee shall submit a plan to the Department for approval by July 5, 1989, outlining where the experimental plot will be located, how it will be operated, and how it will be monitored.

11. Land Treatment Demonstration Plot Testing

A one-time sampling of the land treatment demonstration plot, to which wastes were applied at a 5% benzene extractable loading rate, shall be performed prior to application of wastes to the full scale unit. The purpose of the sampling event is to collect information about the long-term persistence, if any, of organic constituents or toxicity in land treatment soils.

a. Number of Samples and Sampling Frequency

i. Two randomly selected soil cores shall be taken from the LTD plot. ZOI, TZ, and BTZ samples, as described in this Module, shall be collected for analysis, for a total of six uncomposited samples.

b. Analytical Parameters

i. All six samples shall be analyzed for the PHCs shown in Attachment III.LT.5., Microtox, and acid extractable and semivolatile organic compounds.

ii. The analytical methods shown in Attachment III.LT.12. shall be used.

c. Sample Types and Collection Methods

i. Selection of random sampling sites shall be done in accordance with Condition J.3. of this Module.

ii. Core samples shall be collected with a truck mounted hollowstem auger and split spoon sampler, as described on p. 37-6 of Attachment III.LT.11. Alternatively,

the Permittee is allowed to collect ZOI samples with a trowel spade, or other hand sampling device.

12. Monitoring Activities Outside of the Permit

The Permittee may enter into other monitoring activities not covered by this permit, for the purposes of gathering additional information about the impacts of the land treatment process. Any information gathered in this manner will not be used by the Department for regulatory purposes.

1. Option A Closure Performance Standards

a. In order to complete closure under Option A, the Permittee shall continue normal operating procedures as described in Conditions N.3.a. through N.3.h. of this Module until the standards described in N.1.b. are met.

b. The closure performance standards under Option A are:

i. Total PAH in the ZOI for any uniform area is less than or equal to 10 µg/kg, based on analysis of three composite samples collected as described in Condition III.LT.J.7.a.iii., and evaluated using statistical methods established through Condition III.LT.K.3.a. In determining the remaining PAH concentrations in the soil, values below the PQLs as defined in Condition III.LT.J.4.b.xi. will not be added to the total PAH value. No more than 5 µg/g of the total PAH can be carcinogenic PAH (see Attachment III.LT.20); and

ii. ZOI soils for any uniform area are non-toxic, as determined through the Microtox test or an equivalent bioassay. The Microtox test is described in Attachment III.LT.20. All three composite samples for each uniform area, collected as described in Condition III.LT.J.7.a.iii., shall be nontoxic. If Microtox is used, "nontoxic" shall mean a 15-minute EC50 greater than 100. If a different bioassay is used, the Permittee shall first submit to the Department for approval a description of the test, and supporting information for a "nontoxic" determination.

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accordance with Condition J.7.b.iii. of this Module. If the criteria in Attachment III.LT.2. are exceeded, the Permittee may only place wastes on the areas for which the metals concentrations are less than or equal to the in-soil limits for Paradise wastes only.

e. For the purposes of demonstrating that a life of facility loading rate greater than 80 tons/acre may be acceptable, the Permittee is allowed to make the following demonstration:

i. The Permittee is allowed to set up a demonstration plot within the permitted land treatment area, not to exceed 50 feet by 50 feet in size, or in the LTD demonstration plots.

ii. Although the 5% benzene extractable loading in this plot cannot be exceeded at any point in time, wastes can be experimentally applied at rates exceeding 80 tons/acre, for the 1989 application season.

iii. Based on the results of degradation and constituent migration evaluations for the demonstration plot, the Department may determine, for subsequent application seasons, that the land treatment unit can be loaded at a rate greater than 80 tons/acre.

iv. If such a demonstration is to be conducted, the Permittee shall submit a plan to the Department for approval by July 5, 1989, outlining where the experimental plot will be located, how it will be operated, and how it will be monitored.

11. Land Treatment Demonstration Plot Testing

A one-time sampling of the land treatment demonstration plot, to which wastes were applied at a 5% benzene extractable loading rate, shall be performed prior to application of wastes to the full scale unit. The purpose of the sampling event is to collect information about the long-term persistence, if any, of organic constituents or toxicity in land treatment soils.

a. Number of Samples and Sampling Frequency

i. Two randomly selected soil cores shall be taken from the LTD plot. ZOI, TZ, and BTZ samples, as described in this Module, shall be collected for analysis, for a total of six uncomposited samples.

b. Analytical Parameters

i. All six samples shall be analyzed for the PHCs shown in Attachment III.LT.5., Microtox, and acid extractable and semivolatile organic compounds.

ii. The analytical methods shown in Attachment III.LT.12. shall be used.

c. Sample Types and Collection Methods

i. Selection of random sampling sites shall be done in accordance with Condition J.3. of this Module.

ii. Core samples shall be collected with a truck mounted hollowstem auger and split spoon sampler, as described on p. 37-6 of Attachment III.LT.11. Alternatively,

the Permittee is allowed to collect ZOI samples with a trowel spade, or other hand sampling device.

12. Monitoring Activities Outside of the Permit

The Permittee may enter into other monitoring activities not covered by this permit, for the purposes of gathering additional information about the impacts of the land treatment process. Any information gathered in this manner will not be used by the Department for regulatory purposes.

1. Option A Closure Performance Standards

a. In order to complete closure under Option A, the Permittee shall continue normal operating procedures as described in Conditions N.3.a. through N.3.h. of this Module until the standards described in N.1.b. are met.

b. The closure performance standards under Option A are:

i. Total PAH in the ZOI for any uniform area is less than or equal to 10 µg/g, based on analysis of three composite samples collected as described in Condition III.LT.J.7.a.iii., and evaluated using statistical methods established through Condition III.LT.K.3.a. In determining the remaining PAH concentrations in the soil, values below the PQLs as defined in Condition III.LT.J.4.b.xi. will not be added to the total PAH value. No more than 5 µg/g of the total PAH can be carcinogenic PAH (see Attachment III.LT.20); and

ii. ZOI soils for any uniform area are non-toxic, as determined through the Microtox test or an equivalent bioassay. The Microtox test is described in Attachment III.LT.20. All three composite samples for each uniform area, collected as described in Condition III.LT.J.7.a.iii., shall be nontoxic. If Microtox is used, "nontoxic" shall mean a 15-minute EC50 greater than 100. If a different bioassay is used, the Permittee shall first submit to the Department for approval a description of the test, and supporting information for a "nontoxic" determination.

Principal Hazardous Constituents for B.N. Paradise Land Treatment Units

Organics

Volatiles

- benzene
- ethylbenzene
- toluene
- xylenes (m,o,p)

Metals

- arsenic
- lead

Other*

- pH
- specific conductance (lysimeter samples only)
- Benzene extractables

Polycyclic Aromatic Hydrocarbons

-acenaththene
-acenaphthylene
-anthracene
-benzo(a)anthracene
-benzo(a)pyrene
-benzo(b)fluoranthene
-benzo(ghi)perylene
-benzo(k)fluoranthene
-chrysene
-dibenzo(a,h)anthracene
-fluoranthene
-fluorene
-indeno(1,2,3-cd)pyrene
-naththalene
-phenanthrene
-pyrene

To be evaluated routinely in soil-pore liquid and below treatment zone soils.

* Although these parameters are to be evaluated routinely, their variation or change will not be interpreted as indicating the presence of hazardous constituents.